JUN 1 1925

The ELECTRICAL REVIEW

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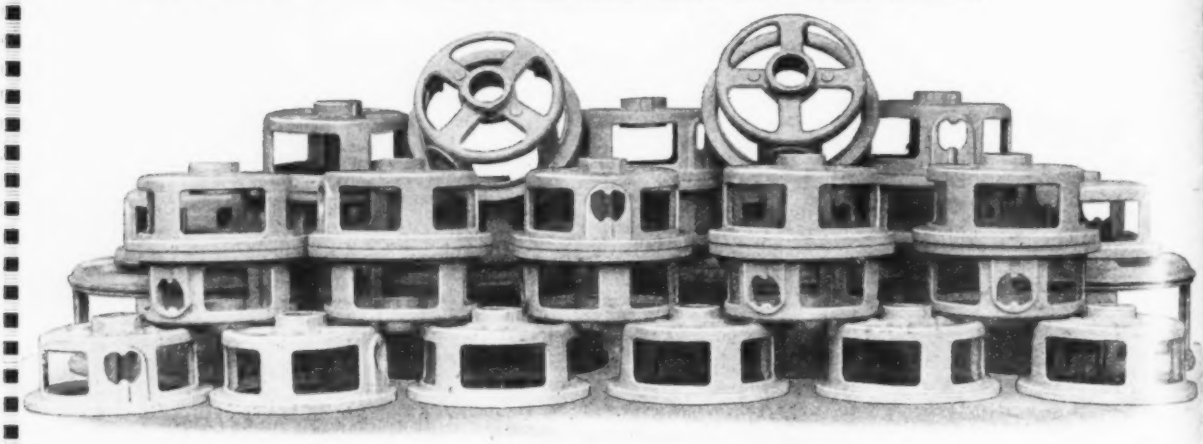

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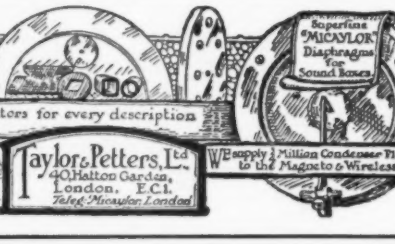

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The

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A New Theory of Light.

ANY physical speculation put forward by an investigator so experienced and distinguished as Sir J. J. Thomson would merit serious consideration, but when it concerns a universal, fundamental phenomenon such as light—which, of course, includes all radiations from the shortest γ rays to the longest electromagnetic waves—and when, in addition, it attempts to disperse the clouds that have gathered round the accepted wave theory since the beginning of the present century, then indeed there is reason for a lively and profound interest. The occasion chosen by Sir J. J. Thomson for announcing his new hypothesis was a lecture given at Guy's Hospital on May 7th in memory of a great teacher of physics, the late Dr. A. H. Fison, and as if to mark with special emphasis the significance of his pronouncement, the Earl of Balfour was in the chair.

The corpuscular theory elaborated by Newton readily explained the properties of light then known, such as its rectilinear propagation and aberration; its reflection and refraction. The genius of Newton, however, foresaw that the simple mechanism of emission of particles could not explain such observations as the coloured rings of thin plates, and he therefore invented an ether in which his corpuscles could excite waves—almost precisely what his successor is now suggesting more than two centuries later. The later discoveries of polarisation and diffraction threw the corpuscular theory into disrepute, and the wave theory of Huyghens and Young, developed mathematically by Fresnel, triumphed completely in explaining all that was known about light some sixty years ago. Then came Maxwell with his theory of electromagnetic disturbances propagated with the speed of light, and his conceptions seemed to put the coping stone on a completely satisfactory, all-embracing theory. The discovery of X-rays, rightly imagined to be but light of extremely short wave length, raised new difficulties, for the action of these in causing electrons to be emitted from gases and metals could not be reconciled with the undulatory theory. Planck's theory of quanta, originally conceived to explain the laws of radiation, introduced further difficulties, and so there remained an impasse: a corpuscular theory satisfactorily explaining the "electrical" effects of light; an undulatory theory which described to perfection what may be termed the "optical" properties of light.

Sir J. J. Thomson reverts to Newton, and combines the two ideas in a single brilliant hypothesis. Light, or energy, is radiated in discrete form, not as corpuscles, but as "rings of energy" detached by the violence of the impact when an atomic disturbance causes the line of force connecting an electron with its atomic nucleus suddenly to jerk round into a closed loop. The circumference of the ring of energy is the wave length of the radiation emitted, and from this follows at once the photo-electric law connecting the speed of an electron with the frequency of the radiation that has ejected it, and the more fundamental radiation law which connects the energy absorbed in an atom when an electron changes its level with the frequency of the radiation.

But that is not the whole story. The pulsations induced in the ring of energy on its formation are supposed to give rise to Maxwellian waves that accompany it as it proceeds through space, and these are the undulations that give rise to polarisation and diffraction and to the forces defined in the equations of classical electromagnetic theory. The absorption of radiant energy is explained similarly to its production, and an indication is given of the manner in which the new conception can explain the phenomenon of resonance. In the absence of resonance, an atom absorbs that energy only which falls upon it; where there is syntony, it absorbs from a volume of space comparable with the wavelength of the radiation, and therefore vastly greater than is contained in atomic dimensions. And so according to this hypothesis, light is both corpuscular and undulatory, and Newton and Young are reconciled.

No hypothesis can take rank as an approved theory until it has been tried and tested, its foundations analysed, and its implications examined. But if this highly-suggestive hypothesis of Sir J. J. Thomson prove to be acceptable, or to be the basis of an acceptable theory, it will surely rank as the most important of the very great contributions which its author has made to our knowledge of the physical universe.

An Electrical Manufacturing Jubilee.

THE celebration of a jubilee in the British electrical manufacturing world has so far been a sufficiently rare occurrence to justify us in extending hearty congratulations to Messrs. Johnson and Phillips, Limited, upon the completion this year of fifty years' continuous activity.

The event was alluded to in the speech delivered by Mr. W. Claude Johnson, the chairman, at the annual meeting, which is reported elsewhere in this issue. It is between two and three years since the Institution of Electrical Engineers completed its half century of operations, which it began under the title of Society of Telegraph Engineers, and since the ELECTRICAL REVIEW celebrated fifty years of growth dating from 1872, when it appeared as the *Telegraphic Journal and Electrical Review*. Mr. Johnson's statement led us to revive our memory regarding the time when Johnson & Phillips, as a firm, first made use of this journal for keeping the telegraphic and electrical world here and in other parts of the world acquainted with its existence, and we note that as long ago as October 15th, 1878 (nearly 47 years) the firm was advertising on the front cover as "telegraph engineers, electricians, and contractors." It is interesting to notice that its offices then as now were at Union Court, Old Broad Street, E.C., and that its works were situated at Charlton. For the first thirty years of their career Johnson & Phillips "carried on" as a private firm; this year, when celebrating the jubilee of the business, they also complete the twentieth year as a limited company. That age does not wither is obvious from the spirit of enterprise which permeates the company, as well as from the statement of success up-to-date as related to shareholders. Not only were the operations and results of 1924 highly satisfactory, the profit being nearly double that of the previous year, while the export trade proportion of the total production was large and is increasing, but, what is of greater interest, the first four months of 1925—jubilee year—have shown record figures, and continued improvement is expected. The concern began, as the chairman remarked, in the days of "small and modest beginnings" in an infant branch of engineering. To-day it takes a pride in holding an important and recognised position in "a giant staple industry," electrical engineering, "the most important section of the engineering industry." The company celebrates its jubilee in the spirit of optimism, determined to take its share in a future holding "still more astonishing progress in store for the electrical industry." Mr. Johnson referred to the rapid industrial expansion that is taking place electrically and to the conviction which must be a constant source of encouragement to us all, that our industry is destined to expand with cumulative effect through an indefinite period of years. While we may deplore that there is so much leeway to be made up as compared with our national employment of electrical service, this backwardness is in itself a ground for future hope as "an asset to British electrical manufacturers."

The Census of Production.

THE importance of the work of preparing for the Census of Production which is now occupying attention should really need no emphasis, yet it is as well that those who, remembering the harassing statistical experiences of a few years ago, are inclined to be irritable under the duty of preparing details and filling in forms relating to their businesses, should be reminded that without accurate figures regarding production in our industries it is impossible to have a complete picture or record of our trade. Further, without a reliable record of what is happening, safe deductions as to policy and developments, whether for private parties as producers or traders, or for the nation as a whole, can hardly be reached. The speech of Sir Philip Cunliffe Lister at the Constitutional Club appealing for the co-operation of every industry in making the Census as complete as possible, is timely and also presumably necessary. He wished it to be understood that the collection of such material was not merely an intellectual exercise pleasing to the official mind, nor was it designed for the purpose of bothering manufacturers. He described it as the only way of taking a real balance-sheet of the national resources and the national output.

At the present time we are dependent upon statistics and estimates, valuable enough as far as they go, prepared by Government Departments respecting exports and imports, and compiled by trade associations regarding present production, activity and prices, but so many things have happened to render our comparisons of this or that year with some period in the past so difficult, that many minds are very much at sea, and they have to be content with doing their best according to their light. We may be able to arrive at some rough approximation regarding the volume and value of trade that we are doing in comparison with the total trade of the world now and at some earlier stages, but whatever we find as the result, we are confronted with the imperative necessity for doing more and still more of this or that kind of production if we are to secure the needed revival and the improved volume and value and profit aggregate in sales. When the Census is complete at some date in the future, it will be of assistance to the industries which provide the material from which it is compiled, but even then, as Sir Philip remarked, the co-operation of those industries will be essential if the figures of production in our basic industries are to be kept up to date.

German Electrical Industry.

RECENT statements regarding increasing activity in the electrical industries of Germany receive confirmation in the report of the Berlin Chamber of Commerce for the first quarter of 1925, wherein it is remarked that a number of branches of the trade received increased orders due to "the provisional pacification of political conditions." The improvement in employment in Germany, to which we referred last week, is understood to have been considerably assisted by electrical activity. The

report of the Berlin Chamber shows that there has been a revival in orders from the electricity supply works which, after suffering from overloaded networks, have now been able to proceed with complementary and extension works which for some years have had to be postponed. Large orders for cables, generators, and motors have resulted, while there has simultaneously been proceeding an improvement in the demand for cooking and heating apparatus and other domestic installation appliances. Industrial installation orders have not been conspicuous in the increasing demand, but they are described as not unsatisfactory in general, excepting in the case of the mines, which are unable to incur large expenditure. Business in telephones revived only slightly, but the turnover in radio apparatus frequently afforded compensation for deficiencies in other weak-current appliance business. Some orders were received in connection with the electrification of sections of the Reich railways, as well as for other electric railways and tramways and industrial railways.

Tests of Heavy-Oil Engines.

At a joint meeting of the various Institutions concerned, held at the Institution of Civil Engineers on May 6th, the Heat Engine Trials Committee presented for discussion its new standard form for tabulating the results of tests of heavy-oil engines. Containing as it did no fewer than 142 separate items, it appeared a somewhat formidable document, and although it was clearly explained on behalf of the Committee that many of these were not considered necessary for an ordinary commercial test, a decided feeling was shown that a very much simpler and shorter form was required to meet the case of the manufacturer of small engines in bulk. The real clash of opinion, however, arose over calorific values. The Committee has adopted the "higher" calorific value as the proper one, and we think rightly so. It can be determined directly with a calorimeter, whereas the "lower" value is a calculated figure involving an ultimate chemical analysis of the oil before it can be computed. The oil engine makers like the "lower" value not merely because on this basis their thermal efficiencies are greater, but because they cannot really give a close guarantee on any other basis. No existing oil engine can use the latent heat of the water-vapour formed by the combustion of hydrogen in the oil. Hence when the higher calorific value is adopted, an engine which will meet its guarantees with one class of oil may not meet them with another fuel of equally great calorific value but richer in hydrogen. It might appear that this difficulty was sufficient to warrant the adoption of the "lower" value, with all its practical drawbacks; but there is, as one speaker pointed out, another aspect. The "higher" calorific value is the heat actually given out in the calorimeter. The fact that, as at present constructed, an oil engine cannot utilise the whole of this heat is no sound argument for altering the basis. Let us keep to the "higher" value, and let the lower figures obtained for efficiencies be a continual reminder that available heat is going away unutilised. As matters stand we believe that the "higher" calorific value has been definitely accepted by the Committee as the proper basis of thermal efficiency. We hope there will be no wavering on this point, although no reasonable person would reject the suggestion made at the meeting that the standard form should contain a line for entering the "lower" value if desired. Anyone studying the tests will then be able to compute the efficiency on any basis he likes, and can compare the performance of the engine intelligently with that of another working on a different class of fuel. The Committee will never succeed in pleasing everybody, and it would be surprising if the members were unanimous amongst themselves on many points. They would, however, do well, we think, to consider the advisability of issuing a really simple form for commercial tests of engines of, say, less than 100 b.h.p. If within their terms of reference they might also give an authoritative decision as to how the b.h.p. of an engine should be rated. This would prevent unfair competition, especially of over-rated foreign engines with British engines of more substantial construction.

The Boycott of the Kiltless.

Our pages have in the past contained interesting reflections on the reasons influencing the disqualification of candidates for certain public electrical appointments in Ireland. We have no wish to stir up that stagnant pool, but the memory of such incidents moves within us once more as a correspondent addresses us regarding a peculiarity that has lately arisen not in the Emerald Isle but Across the Border. The public authority north of the Tweed which recently required an electrical engineer did not state in its published advertisement "No Englishman need apply!" but if rumour and local Press reports be correct, some such attitude was taken up in committee when the merits and demerits of the selected candidates came under close consideration. Wen who are chosen for interview because of their experience, qualifications and apparent general fitness for a job ought to be afforded the opportunity to appear before the committee, and should not be scored off because they happened unfortunately and without being consulted to have been born into a kiltless community. A Highland newspaper, commenting upon the matter, remarks that the poor Sassenach is considered very desirable company as a tourist or a "residenter" with money to spend, but when it is a question of presenting himself to support his credentials, he is desired to keep south of the Tweed.

The I.E.E. Annual Report.

The report of the Council of the Institution of Electrical Engineers, presented at the annual general meeting last week, shows that the membership, which has increased enormously since the war, is still advancing, though not so rapidly, and should be over 12,000 within 12 months. Had industrial conditions been more favourable that stage would probably have been passed by now, for no fewer than 374 memberships lapsed—mainly in the Student class—and there were 147 resignations. Unfortunately there was a heavy death-roll, which included many well-known names—not least, that of Mr. C. H. Wordingham.

The fact that no fewer than 365 meetings of all kinds were held during the year speaks well for the activities of the London Headquarters and the Local Centres, the Council and Committees. Many of the meetings were "informal," and the popularity of this system appears to be well established; it enables the junior members (and some diffident seniors) to take a full share in the discussions and is an invaluable means of training speakers.

We are pleased to see that the British will be well represented at the forthcoming International Conference in Paris, and it is to be hoped that a large number of unofficial representatives will attend the meeting, which is rapidly gaining in importance and fruitfulness.

Brief reference is made in the Report to the work of the Joint Standing Committee of the Board of Education and the Institution in connection with the training of electrical engineers; too little is known about this very important branch of the Institution's work, and a more detailed account of it would be welcome.

Lastly, we wish to draw attention to the deplorable neglect of the Institution's Benevolent Fund. Last year 78 grants were made, involving an outlay of £1,322; yet the income from donations and subscriptions was only £1,152—not enough to cover the outgoings—and the regular subscriptions amount to an absurdly small sum, utterly unworthy of the Institution and of the purpose. What is most regrettable is the small number of subscribers. Even if every member gave only one shilling, the amount received would far exceed that actually derived from this source. This is a poor showing for an industry which is by no means so ill off as many others.

E

Discontent and the Lack of Policy.

A Few Notes.

By "JUST BIDE A WEE."

Many will, definitely, be disinclined to believe that any serious discontent exists in electrical circles to-day, yet the contrary is, unfortunately, too true. For example, how often is the following, or its equivalent, confidentially whispered between buyer and agent, draughtsman and foreman, foreman and worker, or in general conversation:—"Fact is, between you and me, the boss is looking for a scapegoat on this job. I had nothing to do with it myself, and I'm only cleaning up another's dirty work. I'm looking out for another crib . . . ." and so on, *ad lib*. This kind of thing seems to exude upon the slightest provocation, and is not merely confined to one side only. Contemptuous reference to inferiors is just as marked, and, in essence, evinces precisely the same spirit. Moreover, without yet attempting to assign a reason for this feeling, it seems to have become progressively worse since the slump in trade.

The writer is privileged to come into contact with a varied number of men representing many engineering vocations, and it was realised that apparently two out of every three had something to say against their own people, either collectively or individually. Curiosity, in the first instance, recently led to notes being made over a period of some weeks, and, with some surprise, it was found that approximately seven in every ten persons were hardened grousers. The remaining three were exactly the reverse, and appeared to be quite contented as they stood. The reason for this latter seemed to be fairly clear, but it will be referred to later, as it has an important bearing on what immediately follows. Calling for something more than mere comment, such a state of affairs demanded some analysis, and some further observations and notes were made. These showed that the prevalent grumbling (a term covering a multitude of sins) could be divided generally into four main kinds, and, further, that a reasonable cause for all could be stated. The divisions referred to appear to cover grumbling due to

1. Lack of encouragement.
2. Inconsistency.
3. "Brain picking."
4. Duress.

It will be noticed that the headings are of a very general order, but that they are few in number. However, they cover many matters, and apply in a perfectly unbiased manner to both employer and employé, superior and inferior, and so on. Each division, then, merits some remark, especially since a common cause of all of them may be cited.

1. *Lack of Encouragement.*—This was noted to be of three kinds, *viz.*, (*a*) financial, (*b*) moral, (*c*) material, the first and second representing the personal side of the matter. Thus, the two primary grumbles are, "This man's not paying his way," and "I'm not getting enough for what I'm doing for them." Leaving out of court exclamations due to personal spleen or bigotry, it might well be asked if any firm really knows whether any stated hand is "paying his way." In how many instances can it be stated with any degree of certainty that a man is *not* paying his way? The answers to these points involve a discussion on the merits of a system of payment by results, but it is confidently believed that no such system has yet been evolved which will answer the points with the necessary degree of accuracy. The present systems of "salary plus commission," and "time and bonus," come within a certain distance of settling the matter, but do not quite attain that end. They can no more determine accurately if a man's work pays a firm than they can determine if it pays the man to remain with the firm. A reference to the notes, however, showed very definitely that these systems were preferred to any of the others, *e.g.*, pure piecework, salary only, or time only, and a clue is thereby found to the cause of the trouble. A definite standard by which to judge results is desired by all. This, apparently, rarely exists. That is to say, there appears to be no black-and-white ruling in any agreement entered into which definitely states a certain standard, say, of output or payment, by which results may be judged. Now, this does not merely mean "2½ per cent. on all sales above £5,000," &c. This type of agreement is, admittedly, common, but its lack of standard is just its fault. It does not, for example, state any limitation as to working hours, or what these must include. If it did, all might be well. As it is, hardships are well known to be undergone through its lack of definition. The traveller, say, who has to work a "hard" district, gets up at 5 a.m. and stops at 10 p.m. in order to make his 2½ per cent., while in an "easy" district his colleague may easily reverse the hours for the same commission earned. This is, obviously, grossly unfair. Yet it could be easily rectified! It is only necessary to put down definitely and concisely in black and white, the *exact policy* to be followed in each individual instance. That this is clearly lacking, in the general case, has been proved by the notes.

An agreement entered into and *signed* by all concerned is quite straightforward and frank. Moreover, it is accepted as "the thing" that an honourable contract can only be broken in a manner definitely stated in it. And no contract would be signed if it were not satisfactory to all prospective signatories.

The same spirit pervades the moral part of the theme (*b*). It is a common experience of agents and representatives to have what they have just said to a customer turned down per telephone from headquarters. Thus, if an agent, to book an order, throws in with motors, &c., some ragbolts as an extra inducement, it is ten to one that his principals will demand the price of these; and so on, to any number of examples. The cure here is precisely as above, but, to put the point more clearly, take the example of a large daily newspaper handling large quantities of typescript, &c. The equivalent here, of the point considered, lies in the general "style" of writing. Such a newspaper is forced to provide for its staff a book, variously termed Style Book, Regulations, &c., and to compel the staff to follow its lead in all matters. The volume contains definite and irrevocable rules respecting "words *not* to be used in this paper," "manner of titling to be used," "abbreviations forbidden," &c., &c., all of which is perfectly sound common sense. The result is that the paper appears with all of its articles welded into a harmonious whole. Unfortunately, the electrical equivalent of the Style Book appears to be *non est*.

The material side of the question (*c*) is, possibly, more difficult to get over. It applies to matters of delivery, quality of goods actually supplied as against those quoted for, customer's financial stability, and so on. For example, it is very hard for one to book an order only to find that after "net m/a/c" has been quoted, headquarters demand cash before delivery. Or, again, to save *themselves* trouble, workmen will fit, say, a slack brush box which, delaying an urgent test, causes trouble all round. Mention need hardly be made of the vexed question of delivery, and dozens of other examples might be cited applying to all aspects of the trade. But the general cause of all is clear, and that is entirely a matter of the lack of some perfectly definite and *fixed* rules by which all may regulate their business conduct.

(2) *Inconsistency* can be considered under similar general aspects. There appear to exist (*d*) financial inconsistency, (*e*) moral inconsistency, and (*f*) material

inconsistency. Of these, (*d*) and (*f*) do not appear to be present to such a degree as (*e*), which, unfortunately, seems to occupy too prominent a place for comfort.

In factories where piecework is the rule, price cutting is, in many instances, still a regular practice. Similarly, when a job is taken on at a loss, an agent's commission will be cut so that he may bear a certain portion of the loss, irrespective of the responsibility for the loss: a point of questionable integrity. Again, on a given journey, a traveller will book 50 per cent. more expenses. Under these conditions grumbles must arise somewhere, but in so doing, they betray the lack of definite policies of dealing with the respective matters. Getting rid of the trouble can only be accomplished by having things written down in black and white. By this apparently slavish dogma is not meant, of course, that men must become automata or anything so absurd. But, since all truly efficient business *is* a matter of good principle, what is there to hinder the publication of the principle?

The point of moral inconsistency covers, possibly in the largest degree, a host of incongruities and illegalities. Tipping, either in money or in kind, is prevalent. The poaching of information through paid (unofficially, of course) members of other firms, appears, from many reports, to exist to a considerable degree. Handing out different guarantee treatment to one customer as against another appears to be a common occurrence. These examples, and a host of others, seem to be matters of everyday practice. Can it be wondered, therefore, that grousing is so prevalent? The only cure is, of course, for some definite line of conduct to be drawn up, covering the needs of the case. Why not? It does seem strange that directors, as individuals, will insist on having everything legally ship-shape, while they, collectively, do not seem to care one iota whether the same state of affairs obtains in the general business matters of the firm or otherwise. This *is* inconsistency.

Material inconsistency, being more or less a corollary to the moral part of the matter, need not be stressed. The point is that if definite policies existed, it would not arise, for a definite works policy *must* involve the thorough inspection of all parts. There is no works "policy" without inspection, or its equivalent.

(3) "*Brain picking.*"—The connection between grumbling and this matter is fairly evident. There always exists the superior who, although an absolute ignoramus, manages to bluff his way to the top of the tree (so called). Everyone appears to know this person intimately. His psychological analysis would surely reveal some remarkable facts! Possibly, and, it is admitted, generally, money "got him in with the boss" at the beginning, but the queer thing is that he appears to rise as well as the others, who are generally his intellectual superiors.

Another instance is noticed in the obtaining of "fake" tenders for plant, as many draughtsmen know. Many a time and oft they make out elaborate details for no purpose. A firm might want to incorporate in some plant, say, a special purpose fan, and, not possessing the complete knowledge necessary to design such, send out numerous inquiries, from which an "average of the lot" affair is produced, which might, or might not, work. Strangely enough, these creations seem to work out in practice to within the limits of *commercial* accuracy, and the completed plants are duly despatched, the user generally, after a while, being left with the baby to hold. Absolutely no credit is given to the real originators of the parts so "scrounged" (the word is ugly but expressive). Similarly, instances regularly occur in which repair firms unable to estimate a repair properly, inquire from another firm, sometimes the maker, a repair figure, and quote this as their own. Again, a department badly mismanaged, will deliberately trade on the fact that the firm as a whole shows a profit, to the resultant detriment of the departments that are efficiently conducted.

The principle is, perhaps, most widely seen at work in the relations between retailer and maker. The former buys and sells the goods in the majority of instances without ever seeing or handling them, and if anything goes wrong *he* doesn't take the responsibility, even between his client and himself. In fact, he seems to trouble little about the matter other than to get the maker to "send a man," &c. In nine cases out of ten it is the maker's experience that the retailer owns not the faintest idea about such a matter.

The whole trouble considered under this section is due to the lack of a national electrical policy (*not* a money-grabbing affair, by the way), or perhaps a national statement of the pure ethics of the matter. Realising this to be so, our American cousins have already had such a statement in circulation for some years. Reports indicate a better business mentality resulting therefrom, and there appears to be no reason to disbelieve that similar effects would be felt here were the same condition to obtain. Doubtless the various institutions, registering societies, and manufacturing associations will, in the future, require to come together to discuss the matter. It is hoped that they will. A conference of some kind appears to be a much-felt want.

From the foregoing it might be reasonably concluded that if the definite statements of policy referred to were duly inaugurated, grumbling and discontent would, to a very large extent, be obviated. This seems to be the case, for, referring back to the original statistics obtained, the remaining three men out of every ten were quite contented with their lots. In every instance these gentlemen were employed by very large multiple concerns of good standing, or by municipalities. Promotion, payment, business methods, &c., depended upon definite fixed policies in operation prior to their entering their present concerns and to which they affixed their signatures on taking up their duties. They *know* how to act in all matters of importance, and that appears to be the main thing. The fact that, when any difficulty arises, an employé may know just exactly whether he can settle it himself or refer it to headquarters without loss of prestige to either customer or himself, makes for much that is good for the trade at large. Similarly, a foreman, able to rush through a sudden breakdown repair for one who did not go to the office first, &c., is in an enviable position.

(4) *Duress.*—The reader may be surprised at this title, yet its connotation will be apparent from, and best illustrated by, the following anecdote—perfectly authentic—in which, for obvious reasons, firms and persons shall be nameless. It is only fair to say that, of the types of discontent cited, it constitutes the least, but it exists in sufficient magnitude to merit note.

Some commercials were recently chaffing one another, one, A, being partly the subject of the banter. Representing a monopolistic concern, he apparently took the fun in good part, especially when B created a laugh by referring to A's "tin-pot" firm. B's surprise may be judged when he received an exceptionally peremptory letter from A's firm threatening legal proceedings unless an abject apology was immediately forthcoming. A man of some decency, B apologised, receiving in return a further sharp letter stating that while the incident was now closed, heavy penalties would be inflicted if further like remarks were made. And now, from time to time, B receives, in divers manners, quite indefinitely, of course, advice when A, or A's colleagues, will be in certain districts. No more need be said! Is not this an illustration of the pressing need for the establishment of a definite standard of business ethics?

In conclusion, taking everything into consideration, it is thought, frankly, that the time is now ripe for the introduction of definitely-accepted and more or less binding policies into business as a whole, and into the conduct of firms and employés as individuals. Unless such become universal, the elimination of grumbling discontent will remain as far off as ever. It is, further, true that those responsible have the knack of surveying all from the heights of Olympus, but, it must be candidly admitted, unless these individuals come down to solid Mother Earth, there will be no lifting of things out of the rut into which they have, clearly, worked their way.

The Hunt Self-Paralleling Alternator.

A New Three-Phase Generator.

We recently had the opportunity of witnessing a demonstration at the Leckhampton quarries, near Cheltenham, of the unusual self-paralleling properties of a new type of alternator. The object of the tests was to show that the new machines will continue to run in parallel satisfactorily under conditions which would render the parallel operation of the usual types of generator impossible.

The two machines furnish power for electrically driving the machinery in the quarries (which installation will be described in a later issue). They were de-

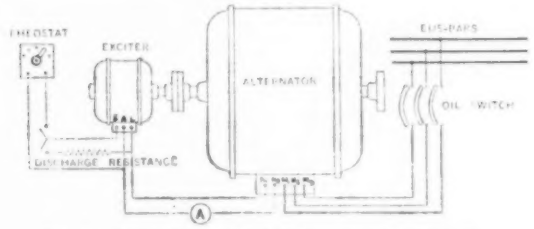

Fig. 1.—Connections of Hunt 3-phase Cascade Alternator.

signed by Mr. Louis J. Hunt, M.Inst.C.E., M.I.E.E., and built by Messrs. Sandycroft, Ltd., to the specification of Mr. H. D. Wilkinson, M.I.E.E., M.I.Mech.E., consultant to the quarry proprietors. The alternators are designed with an air gap of 0.06 in. for an output of (160 kW) 200 kVA, 440 volts, 3-phase, 50 cycles, at 0.8 power factor and a speed of 250 r.p.m. Each is coupled direct to a Premier 4-cylinder, 250-b.h.p., producer gas engine, and is provided with a 36-V, 165-A exciter on the same shaft as indicated in fig. 1.

An induction generator (*i.e.*, an induction motor driven above its synchronous speed) does not require paralleling, and would be an ideal generator of alternating current but for the fact that it is not self-exciting and is incapable of furnishing magnetising current. The Hunt cascade alternator is, in effect, a combination machine having two stator and one rotor windings; it is two-thirds an induction generator and one-third a synchronous alternator, the latter element supplying the power and magnetising currents to the non-synchronous element. This arrangement results in a machine which does not need to be synchronised before it is paralleled with others; fig. 2 is a key diagram of a 440-volt cascade alternator winding, while fig. 3 applies to a 3,000-volt machine.

The speed being 250 r.p.m., the number of poles is 24; the machine's operation is most easily followed by

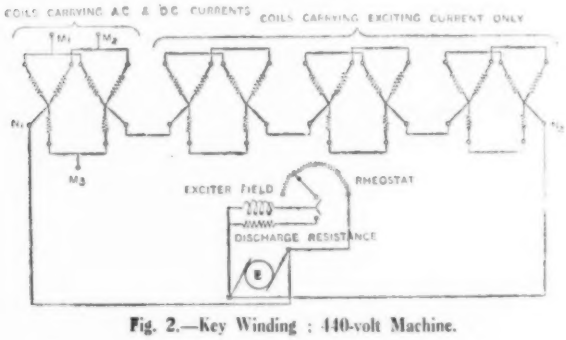

Fig. 2.—Key Winding : 440-volt Machine.

considering its two elements as if they existed separately—an 8-pole synchronous alternator with a stationary field and a 16-pole induction generator having a distributed rotor winding, the two machines being directly coupled and their rotor windings connected together. The 8-pole stator winding is connected to the exciter and the 16-pole stator winding to the busbars. When the machine is driven at 250 r.p.m., currents are generated in the 8-pole rotor winding having a frequency of $16\frac{2}{3}$ cycles per second; they flow into the rotor windings of the 16-pole machine, and produce in them a magnetic field which rotates round the rotor itself at a speed of 125 r.p.m. As the rotor is also driven at 250 r.p.m., the field rotates in space at a speed of 375 r.p.m., and, therefore, generates 50-cycle currents in the 16-pole stator windings.

The 8-pole synchronous machine supplies to the rotor of the induction generator currents which are in phase advance of the e.m.f. generated in its stator windings, and so provides both the magnetising current required to excite the 16-pole field and that required by the inductive external load.

The practical alternator has a single core which carries the resultant of the 16- and 8-pole fields. It is constructed like an induction motor, the stator and rotor cores being built up of laminations provided with slots, those of the stator being open and those of the rotor almost closed. The rotor slots carry a simple short-circuited winding which produces the same effects as two independent 16- and 8-pole windings. The rotor has 192 slots, in 96 of which there are two bars in each slot, and in the remainder one bar. The stator has 144 slots, in which is placed one winding which carries both the 50-cycle alternating current and the continuous current supplied by the exciter. There is also an additional winding in which flows only the exciter current; the windings are shown in the accompanying diagrams,

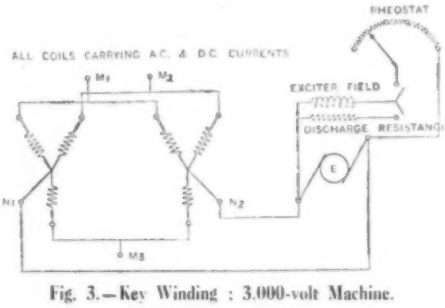

Fig. 3.—Key Winding : 3,000-volt Machine.

which show that the alternating current is supplied by two sections of the winding, which are connected to form two parallel stars. The exciting current flows through this winding, entering by the neutral of one star and leaving by the neutral of the other. In each pair of paralleled branches of the winding the exciting current flows in the same direction as the alternating current in one star and in the opposite direction in the other, and so produces only 8 poles, whereas the alternating current produces 16 poles. The remainder of the winding carries only the exciting current, all the units of the winding being connected in series with the exciter. By arranging the windings in four similar units and placing similarly situated wires of each unit in the same slot, there is no necessity to insulate the sections from one another as there is no difference of potential between them. This simplifies the construction; also by using these units the required paths are provided for the flow of the induced currents upon which successful parallel operation depends. The stator winding is so arranged that when the rotor speed is no longer synchronous, the currents which are induced in it produce mainly a magnetising effect, the restoring torque being developed by the rotor current. It has been found that if a winding is used for the stator which permits the induced currents to flow mainly across the centre of the 8-pole field, and therefore to provide a large restoring torque, the machine will no longer be self-paralleling.

For demonstration purposes the Leckhampton machines were subjected to three tests: First, they were run in parallel with all four cylinders of each engine functioning; then gas was cut off in rotation, so that the engines ran with 4 and 3 cylinders respectively; 4—2; 3—3; 3—2; and finally with 2 cylinders each, the alternators functioning normally throughout.

Secondly, the machines were paralleled in phase opposition; when dead out of phase the momentary rise of current was about 80 per cent. more than the full-load current of one alternator.

Thirdly, the generators were paralleled when one set was about 4 per cent. low in speed (*i.e.*, 48 instead of 50 cycles), the momentary rise of current not exceeding the previously mentioned figure; it is claimed that it often does not exceed the full-load current of one machine.

During the tests the machines carried a very small load in order to make the running conditions as severe as possible, and they were not ameliorated by the fact that compression continued to take place in the cylinders, the gas supply of which was interrupted. The alternators ran well throughout. By obviating the need for skilled manipulation, such machines will naturally reduce running costs, and their ability to float on the line should be of advantage in small hydro-electric installations. An interesting case is an installation at a mill in Scotland, where one of these alternators is coupled to a Boving water turbine. During the winter when there is plenty of water the machine runs as an alternator in parallel with the electricity supply company's mains. When the mill is shut down, power is supplied to the town in parallel with the supply company's alternators. During the summer, when there is insufficient water to drive the turbine, it is uncoupled and runs as a synchronous motor, correcting the power factor and driving part of the mill through a chain drive. A feature is stability; at times the quantity of water available varies rapidly, and the machine has to change rapidly from an alternator to a synchronous motor, and *vice versa*, the only effect noticeable being the reversal of the energy meter.

The Hunt alternator should, however, be particularly useful in cases where it is necessary or desirable to employ a gas or oil engine as the prime mover; in contrast to the conventional type of alternator, the new machine does not need a special engine to drive it, and in those cases where it becomes necessary to change over from d.c. to a.c., the installation of Hunt machines will enable the old engines to be retained without modification. Single- and 2-cylinder engines are quite suitable, and a reduction in cost can be effected because, as a heavy flywheel is not necessary, the engine parts can be lightened.

At the works of the British Steel Piling Co., Ltd., Gaydon, near Ipswich, a Hunt alternator of 210 kVA capacity, driven direct by a 4-cylinder semi-Diesel engine, has been satisfactorily run in parallel with an ordinary revolving-field machine driven by a Bates single-cylinder gas engine.

Costing.

By HERBERT G. CLAYTON.

In most manufacturing concerns the necessity for a correct system of costing has for long been realised, and strenuous efforts have been made to compute accurately the true expense incurred in the production of articles of manufacture.

The aim of the cost accountant is to ensure the correct allocation of all costs. This is not always a simple task; in practice, it is found that certain items are apt to go astray, and instead of being debited to a special unit, or contract, they swell the sadly abused "General Expenses" account.

The most expensive portion of costs to-day is, of course, labour. Every firm must employ "productive" and "non-productive" labour, although the latter term is really a misnomer, as no work can fail to be productive in some direction. However, the term will suffice if it is understood to mean no definite pecuniary gain to the firm. In addition, there is a third labour charge which is made to cover the work performed by the office staff, including travellers, and is somewhat euphemistically called "salaries."

Thus we find that there are three items of monetary outlay for services rendered, in different manners, by the employés of a concern, and these must be thoroughly analysed and fully considered before prices are fixed for the sale of goods produced.

It is, furthermore, essential to keep a record of the ratio between the different classes of labour. For instance, if the amount paid weekly as "productive" wages is taken as 100 (working at full time) and "non-productive" as 20, then, should a diminution of orders occur with a consequent drop in productive wages to, say, 75, the non-productive wages should correspondingly fall to 15, if the same proportion is to be observed.

In dealing with materials, it must be borne in mind that stock is equivalent to money—and is just as important. The stores ledger should be thoroughly checked with the purchase journal and cost ledger, and this, *inter alia*, should do much to prevent any great disparity between the cost accounts and the financial accounts.

Materials should only be issued by the storekeeper upon receipt of a signed requisition form, and after the materials have been supplied, the requisition form should be sent to the costing department, where the necessary transfer will be made to the particular account in the cost ledger.

The question of "overhead" charges is one of perennial importance, and must be fixed so as to reduce the risk of over-estimating or under-estimating this item to an irreducible minimum. The usual method is to ascertain the amount involved (which, of course, includes salaries, rent, lighting, telephone, office, &c.) for a definite period, perhaps a month, and the sales for the corresponding period. The formula is then obtained:—

Overhead charges × 100/sales = rate per cent. to be added to prime cost.

Obviously, the total cost is then obtained, and the only thing remaining is the fixing of the selling price. In the electrical industry, it is usual to print price lists with the full retail price, and allow the contractor a discount. Assuming this at, say, 25 per cent., it is necessary to *add* 33⅓ per cent., as is shown by the following:—

Actual selling price	£10	0	0
List price (add 33⅓ per cent.)	3	6	8
	£13	6	8
Trade price (less 25 per cent.)	3	6	8
	£10	0	0

Thus the original fixed selling price is maintained.

The costing system should supply all information with regard to labour, materials, work in hand, charges and expenses, and agree with the financial accounts. If an existing system fails accurately to accomplish this, it should be abolished and an efficient costing service introduced.

Reviews.

Fluxes and Slags in Metal Melting and Working. Pp. 96; figs. 19. London: The Faraday Society. Price 7s. 6d.

The volume under review is a reprint of a general discussion held on April 28th, 1924, jointly by the Faraday Society and the Institute of Metals, with the co-operation of the British Non-Ferrous Metals Research Association and the Institute of British Foundrymen. The discussion was originally restricted to metal melting, welding, and soldering, but frequent references were made during the discussion to general metallurgical processes. Professor C. H. Desch, F.R.S., in an introductory address, stated that our knowledge of fluxes in non-ferrous metallurgy showed that little systematic scientific work had been done, and that our knowledge of the subject was principally empirical. Much of the action of fluxes in welding and soldering depended on the property of "wetting" metallic surfaces; it was essential that the solder should "wet" the metal before it could adhere to it. The function of the flux was principally to remove the surface film of oxide or other foreign matter which prevented the "wetting" or coalescence of the metallic particles. Dr. Desch suggested that fluxes act by reducing the surface tension, and that interfacial tensions should be further studied.

The first section of the discussion was allotted to metallurgical papers; the second related to "Slag Inclusions, Welding and Soldering." Prof. B. P. Haigh, D.Sc., stated that experimental research supported the view that slag inclusions in an otherwise sound metal tended to promote fatigue, and that evidence was available that a fatigue crack, having once been opened at some zone of weakness, would spread through sounder parts of the metal. It had been shown that ductile metals, subjected to stresses that pulsated without changing direction, might be comparatively immune from the ill-effects of slag inclusions, provided that these were small.

Mr. H. Ogden, of the Sir John Cass Institute, read a paper on "Fluxing Problems in Welding Mild Steel with the Metallic Arc," in which he stated that a welding flux should contain substances of high thermionic emissivity, so as to localise and increase the penetrating power of the arc as well as to add stability. The author's experience coincided with that of Professor Neese, that fluxes in general increased the number of blowholes and slag inclusions in the weld metal. Referring to the soldering of aluminium, using the metal itself or its alloys, Mr. Coulson-Smith maintained that the joints made did not maintain their strength for any length of time. "Fluxes and Slags in Welding" was the subject of a communication from Mr. W. Spraragen, Secretary of the American Bureau of Welding, and consisted of a digest of the opinions of experts in America on the subject discussed. Dr. W. Rosenhain, F.R.S., and Mr. S. L. Archbutt, of the National Physical Laboratory, read a paper on "The Use of Fluxes in the Melting of Aluminium and its Alloys," and maintained that the re-melting of aluminium would not introduce oxide if the melting was done at the lowest possible temperature, but Dr. Seligman questioned this statement during the subsequent discussion. Mr. Lobley said he had found zinc chloride to be the most effective flux for aluminium scrap melting. A general outline was given by Dr. T. Lewis Bailey of the use of zinc chloride as a flux in the tinplate industry, reference being made to the *role* of palm oil in the tin plating operations. Mr. T. B. Crow contributed a paper on "Fluxes for Soft Soldering." The volume is one of the most important and useful of those issued by the Faraday Society.

Electrical Circuits and Machinery, Vol. II, Alternating Currents. By J. H. MORECROFT, Professor of Electrical Engineering, Columbia University, and F. W. HEHRE, Associate Professor of Electrical Engineering, Columbia University. Pp. xi+444; figs. 426. London: Messrs. Chapman & Hall, Ltd. Price 20s. net.

The greater portion of this book is devoted to a consideration of the laws governing the flow of alternating current in circuits and to an account of alternators, motors (of the synchronous, induction and commutator types), converting plant and transformers. In addition, there are chapters dealing with instruments for use in alternating current circuits and with the subject of power transmission.

Some idea of the scope of the work will be conveyed if we mention that though it goes well beyond the standard required for the examination of the Senior National Certificate, we should hardly regard it as being sufficiently complete in treatment as to be altogether suitable for use in preparation for the examination for the Higher National Certificate.

Subjects particularly well considered include the vectorial addition of voltages and currents (where great stress is laid upon the vital importance of a systematic method of notation if risk of error is to be minimised in the more complicated cases), the measurement of power in multiphase circuits and the study of armature reaction in alternators and synchronous motors. The treatment of the latter subject is by a novel and interesting method, devised by one of the authors, which appears to lead to clear conceptions of the phenomena concerned.

In general we find the information given in the text to be very accurate, but we do not agree with a statement made concerning a method of synchronising illustrated in fig. 285 (b). It is rightly pointed out that if the three synchronising lamps are connected directly across the three poles of a switch used for switching a three-phase alternator to the bus bars, the correct moment for closing the switch is in the middle of a dark period, but the writers go on to add that if each of the three lamps is connected in zig-zag fashion across the poles of the switch, the correct moment for closing the switch is in the middle of a bright period. This would be quite true in a single-phase case but, though it might be near enough to allow the machines to pull into phase, it would result in a bad "shot" in a three-phase case. In connection with synchronisers it is rather surprising to note the omission of an account of the arrangement for three-phase machines in which two lamps are connected zig-zag across poles of the switch (the third lamp being straight across one pole) which permits of an indication whether the incoming machine is too fast or too slow. In the section on converting plant the motor converter is not described though, in this country at any rate, it is being looked on with increasing favour.

We should add that certain chapters dealing with numerical work are concluded by a selection of well-thought-out examples whose value would be increased by the addition of the answers.

The general arrangement of the book is excellent, though there are a few external views of appliances which convey little information, a notable case being fig. 283, showing an external view of the Weston Synchroscope. A special compliment may be paid in regard to the index, which is very complete and accurate.

An Introduction to the Strowger System of Automatic Telephony. By H. H. HARRISON, M.I.E.E., M.I.R.S.E. Pp. viii + 146; figs. 86. London: Longmans, Green & Co. Price 7s. 6d. net.

This very handy volume is designed as a text book for students undertaking an instruction course in automatic telephony. In all, there are three chapters dealing successively with definitions, Strowger apparatus, and Strowger circuits, in which the student is led up from the elements of the subject to the latest development in the form of the "Director" system by easy but thoroughly described stages. Those who are familiar with the author's previous works on printing telegraphs will find here the same clarity of expression and abundance of clearly drawn and lettered diagrams that characterise these works.

In addition to purely descriptive matter dealing with the operations of the various pieces of apparatus, a fair amount of space is devoted to the traffic aspect of the efficiency of groups of trunk circuits. Without going deeply into the mathematics of the subject, the methods are shown, and illustrated with curves, by which efficiency values are obtained.

In connection with the relays controlling the Strowger switches, curves of actual oscillograms are given showing the rise of current in coils having both air-space and iron cores; and a brief outline is also given of the theory of the rise of current in inductive circuits.

The 161 diagrams which the book contains will enable the student, who has not access to the actual apparatus, to form an intelligent idea of the system as a whole.

Teachers of electrical technology will find the work to be admirably adapted for introducing their students to the fundamental principles of automatic telephony.

Electrical Drafting and Design. By C. C. BISHOP, E.E. Pp. viii + 165; figs. 65. Tables and Charts. London: McGraw-Hill Book Co., Inc. Price 10s. net.

This book has been written by the head of the Department of Drafting and Design of the Technical High School, Buffalo, New York, with the object of bridging the gap between the usual course in mechanical drafting as taught in technical and vocational schools, and the work a young man is required to do in the office of an engineer or contractor.

The first chapter deals with drawing office instruction; the instruction given is very elementary and insufficient for a student who has finished a course of two years' mechanical drawing at a technical school.

Electrical symbols and their use are considered in Chapter 2. These will be found to be of very little use to the English draughtsman, because some of the symbols such as those representing dynamo, resistance, batteries, &c., together with those in the radio chart are not recognised internationally, and many of the others are not generally recognised in England where many manufacturing firms of importance have systems of their own.

Chapters 3 and 4 are really problems on the layout of switchgear panels, size of panels, and wiring diagrams. Details of apparatus to be used are given, together with very brief instructions. These problems would require a person of considerable experience in this class of work to lay out correctly.

The layout of an outdoor sub-station is dealt with in the next chapter, and here again a problem is set and a very brief answer given. The question of regulations enters into this problem, and as the regulations are many and varied, and differ in different localities, this particular problem might well have been left out, or at least been dealt with more fully.

Wiring of machine shops and residences is considered more fully than any of the previous subjects, and will be found useful by the student and working electrician.

A chapter is devoted to artificial illumination, and the information is clear and concise with references for further information if necessary.

Tables of heights for lamps, foot-candle power required for various purposes, and reflection units are given. This chapter is worthy of study, and the problems set are systematically worked out.

About 70 pages at the end of the book are taken up with tables of various kinds, and not more than half of these would be of any value to the English draughtsman. A great number of the tables are standard part dimensions extracted from catalogues, and being of American origin would be of little, if any, use to the draughtsman in this country.

The book appears to be of more use to the electrician who has a slight knowledge of draughting, than to the student with two years' experience, and in no respect does it approach many books on the same subject published in this country.

E. P.

Parliamentary.

[By Our Special Parliamentary Reporter.]

Gas Companies and Electricity Powers.—The Bill introduced into the House of Commons by Mr. Clarry, empowering gas companies to undertake electricity supply, which has already received its second reading, was considered by a Standing Committee of the House last week and reported for third reading without amendment. The Bill consists of five clauses, and provides that gas companies may apply for electricity Orders, that the Electricity Commissioners may grant them in the usual way, and that gas companies may use their funds for the purposes of electricity supply. At present a gas company has to promote a special Bill in Parliament before it can embark upon electricity supply.

Electricity Production. — On May 5th, Sir D. NEWTON asked the President of the Board of Trade the amount of electricity generated in 1913 in this country, the United States, Germany, Belgium and Japan, respectively; and what were the corresponding figures for the years 1923 and 1924.

SIR P. CUNLIFFE-LISTER said that official information regarding the aggregate production of electrical energy in this country was not available for the year 1913 or any year near to it. In the year ended March, 1924, the report of the Electricity Commission showed that 6,682 million kWh was produced. For the United States of America official information was available for the production in 1912 and in 1922 at central electric stations only. The electricity generated at such stations was 11,569 million kWh in 1912 and 40,292 million in 1922. He had no official information as to the production in the other countries named, but as regarded Belgium, a report to the Department of Overseas Trade stated that there was a *capacity* of 456,000 kW in 1923 in that country; and as to Japan, the Official *Résumé* of Statistics gave 597,000 kW as the *capacity* in 1913 and 1,715,000 kW in 1922.

A Local Electricity Supply.—On May 5th, Mr. MACKINDER asked the Minister of Transport if he was any nearer an agreement whereby the Bradford Corporation might supply the Baildon District Council with electricity; and, if agreement had not been reached, what was the obstacle.

COLONEL ASHLEY said that the supply of electricity in Baildon by the Corporation of Bradford was dependent on the terms of an agreement between the Corporation of Bradford and the Yorkshire Electric Power Company. At present one point of difference between the parties was outstanding. The Electricity Commissioners were endeavouring to get the parties to come to terms.

Imported Radio Valves.—On May 5th, Mr. DAY asked the President of the Board of Trade whether he was aware that large quantities of foreign radio valves were being imported into this country and that some of these valves were an infringement upon patent rights held by British manufacturers; that recently several retailers in a small way of business had received writs, issued by the British Thomson-Houston Co., Ltd., which alleged infringement of its patent rights; and whether, in view of the hardship inflicted upon these small traders, he was prepared to cause importers of such goods into this country to make declaration to the effect that the goods did not infringe patent rights held by British manufacturers.

SIR P. CUNLIFFE-LISTER said that he was aware that radio valves were being imported into the United Kingdom, and he understood that during the last twelve months legal proceedings had been taken by the British Thomson-Houston Co. against six infringers, four of whom were importers; all these firms were wholesalers, but two did a retail business also. In each case the proceedings were successful. He had no power to require importers of wireless valves to make any such declaration as that suggested in the last part of the question.

Automatic Telephone Exchanges.—On May 5th, Sir W. MITCHELL-THOMSON, the Postmaster-General, informed Mr. Hannon that 26 automatic telephone exchanges had already been opened. The introduction of automatic working in the London area was necessarily a lengthy and gradual operation. Unless unforeseen difficulties arose, three or four automatic exchanges should be opened in London during 1927.

Private Bills.—On May 8th, the further consideration in the House of Commons of the London Electricity Supply (Nos. 1 and 2) Bills, and the North Metropolitan Electric Power Supply Company Bill was again postponed. The Chairman of Committees ordered that the Bills should be set down for third reading on May 14th.

Electric Road Signals. — On May 6th, Captain BRASS asked the Home Secretary whether, in view of the increasing congestion in the London streets, he would consider the suggestion of sending some police officers to Paris to study the French methods of traffic control by means of single-direction roads and electric signals.

Mr. LOCKER-LAMPSON said the Home Secretary was considering the suggestion in consultation with the Commissioner of Police.

Uckfield Gas and Electricity Bill.—This Bill was considered by the Unopposed Committee of the House of Lords last week, and has been ordered to be reported for third reading. The purpose of the Bill is to dissolve the Uckfield Gas Co., Ltd., which has been supplying gas in the urban district of Uckfield (Sussex), and to re-incorporate it as the Uckfield Gas and Electricity Co., with powers to supply both gas and electricity in Uckfield and a number of parishes. It is proposed that the incorporation should take place as from January 1st next. The capital is to be £40,000, of which £10,800 is to be original capital, and substituted for the existing share capital of the Gas Company, and £29,200 additional capital. The paid-up capital of the existing Gas Company is £9,000, and the new original capital of £10,800 is to be divided among the holders of the Gas Company's stock, in the proportion of £6 of the new stock for £5 of the Gas Company's stock. The additional capital may be apportioned to the gas and electricity undertakings, as desired. Borrowing powers up to one-half of the amount of paid-up capital are sought. Separate capital and revenue and expenditure accounts are to be kept for each undertaking, with due apportionment of management and other common expenses, and power is sought to create reserve and special purposes funds. It is provided that the Minister of Transport may, if he thinks fit, revoke the powers of supply of electricity in respect of any parish or part of a parish if distributing mains have not been laid within three years. If gas mains have not been laid within five years, any local authority, company, or person, may apply for an Act of Parliament or Special Order for the purpose of providing a supply of gas, and for the repeal of the Company's powers.

Legal.

Theft of Electricity.

ON May 5th, Walter Anderson, of Croydon, appeared before the Hove magistrates on charges of fraudulently diverting electricity belonging to the Hove Corporation, and laying an electric line from the Corporation's main without that body's consent. The Town Clerk, who prosecuted, said that the defendant had wired premises in Kingsway, Hove, in such a manner that the current entered the house without passing through the meter. The Corporation had laid a service and had sealed the fuse box, until the installation had been tested. It was found, however, that electricity had been used prior to the test, two wires having been inserted through the bottom of the fuse box, which remained sealed. Supporting evidence was given by a number of witnesses, including an occupant of the house, who said that she had no idea that an illegal connection had been made. Defendant pleaded that he did not think that he was doing anything seriously wrong; he merely wished to give the occupiers of the house a temporary supply for lighting until the work was finished.

The magistrates imposed a fine of £5, including costs, on the first summons, or 28 days' imprisonment in default. The second charge was withdrawn.

British Thomson-Houston Co., Ltd., v. Victoria Electrical (Manchester), Ltd., & Hodgkinson.

THIS adjourned motion (*vide* our last issue, p. 732), came before Mr. Justice Russell in the Chancery Division on May 8th. The plaintiffs sought sequestration and attachment of the defendants for giving up possession of lamps which infringed one of plaintiffs' patents contrary to an injunction granted by the Court.

Mr. COURTHOPE WILSON, K.C., for the defendants, said the order of the Court was to deliver up the infringing lamps to the plaintiffs and not to offer for sale any of the lamps in their possession. The defendants had agreed to pay to the plaintiffs £250 by way of damages and an agreed sum for the costs of the application. As a matter of fact the infringing lamps were sent back to Holland—where they came from, but some time afterwards the vendors returned them to the defendants, and they had lain in stock ever since. The defendants gave up this class of business in June, 1923, and they did not deal in lamps at all until the particular act complained of. The company was in financial difficulties, and it was suggested that it might raise money by disposing of all the dead stock of lamps in their possession. The sale only realised about £20, so that this had been a very disastrous matter for the defendants. Mr. Hodgkinson, as managing director, offered his apologies to the Court for what had happened. He had lost all his money in this company and if sequestration was ordered the plaintiffs would get nothing. Mr. Hodgkinson, however, was raising the money and hoped to be able to pay it to the plaintiffs that week. Counsel suggested that the motion should be adjourned for a week, and that if the money was forthcoming nothing further would happen.

His Lordship assented.

Business Notes.

A Manchester Electrical Trade Inquiry.—With reference to the deliberations, already briefly announced here, of a Manchester Committee consisting of representatives of manufacturers, wholesalers and contractors, we are informed that the Sub-Committee appointed for the purpose of inquiring into the question of "Local Abuses of Fair Trading," has now formulated its report in which suggested remedies are incorporated. This report will be submitted to the Main Committee at a meeting to be held at the Engineers' Club, Manchester, on Monday next, May 18th, at 2.45 p.m.

The Premier and the Engineering Industry.—An important conference was to take place on Tuesday between the Prime Minister and members of the Executive Council of the Amalgamated Engineering Union. It is stated in the Press that the meeting would have been held earlier but for difficulties which stood in the way. *The Times* says that Mr. J. T. Brownlie, president of the Union, was, with other Labour leaders, a guest of the Minister of Labour at dinner a few weeks ago, and Mr. Baldwin was present. The serious position of the engineering industry was the subject of the conference and one proposition was that the Government should assist the industry to find employment for skilled men by putting engineering projects in hand immediately and by facilitating public utility and other works.

Bankruptcy Proceedings.—A. T. RAWLINGS, trading as Rawlings & Company, 357, Upper Richmond Road, Putney, electrical engineer.—The first meeting of creditors was held on May 8th. The statement of affairs showed gross liabilities of £765, of which £637 was expected to rank, against assets of £213, from which had to be deducted preferential claims of £75, leaving net assets of £138, or a deficiency of £499. Debtor attributed his failure to want of capital and insufficient trade to pay working expenses. It appeared that he was employed as a mechanic with a firm of film printers until July, 1924. In September, 1924, he took premises at the above address, upon lease at £180 per annum. He commenced as an electrical engineer and dealer in wireless goods with £200 cash borrowed from his mother-in-law and still owing. He put in a shop front at a cost of £126. The debtor had been continually pressed by creditors since November, 1924, and seven creditors had obtained judgment. He admitted that he became aware of his position in December, 1924. The case being a summary one was left in the hands of the Official Receiver as trustee of the estate. The following are creditors:—

	£		£
Adams, A. H.	46	Peto, Scott	25
Ball, Mrs.	200	Sun Electrical Co., Ltd.	35
Falk, Stadelmann & Co., Ltd. ...	97	Bankers	50
London Electric	23	Stevens, A. J., & Co., Ltd. ...	144

T. N. SHEPHERD, 15, Bridge Road, Stockton-on-Tees, and 5, Queen Street, Redcar, plumber and electrical engineer.—The adjourned public examination of this debtor was held recently at the Court House, Stockton-on-Tees. The statement of affairs showed liabilities of £13,741, of which £12,077 was expected to rank, against assets of £7,368, leaving a deficiency of £4,709. Debtor attributed his failure to losses on contracts, and depreciation of freehold property and stock-in-trade. Debtor stated that he commenced business in 1919, when he purchased a hut at Bridge Road and certain stock-in-trade for £180. His capital amounted to £300. In 1921 he disposed of the hut and purchased the premises at 15, Bridge Road, for £1,000, of which £800 was obtained on mortgage. Certain alterations were made at a cost of £1,000. In April, 1922, a friend whom the debtor had agreed to take into partnership, provided £1,000 as his share of the capital. The partnership was not, however, carried into effect, but the friend agreed to allow the £1,000 to remain on loan. In 1923 debtor purchased premises at Redcar for £3,500, and immediately re-sold them for £5,000. He then purchased 7, West End, Redcar, for £1,800, where a branch business was opened. These premises were sold in August, 1924, for £1,600, and debtor then entered into an agreement to purchase 5, Queen Street, Redcar, for £2,750, and paid £275 deposit. He was, however, unable to complete the purchase and the contract was rescinded. The unsecured liabilities comprised one for a loan of £1,575 from his wife, two for loans from friends amounting to £1,298, and bank overdraft £1,024. Debtor did not become aware of his position until February, 1925. A deed of assignment was executed, and at a later meeting of creditors debtor was requested to obtain guarantees for the payment of a composition of 15s. in the £, but was unable to do so, and accordingly filed his petition. The examination was adjourned.

E. P. HIGGINS (trading as the Western Union Wireless Co.), 99, Regent Street, W.—This case came before Mr. Registrar Francke at the London Bankruptcy Court on May 8th, in relation to his public examination. The receiving order was made on January 28th last, upon the petition of B. Lipton, Ltd., the act of bankruptcy cited being non-compliance with the requirements of a bankruptcy notice duly served upon the debtor. Mr. Ferrars Vyvyan, Official Receiver, reported that the debtor had not surrendered to the proceedings, and nothing was known of his present whereabouts. His Honour adjourned the examination *sine die*. The amount of the liabilities did not transpire.

JOHN WORSLEY, Hollin Cottage, Darwen, electrical engineer and electrician.—This debtor underwent his public examination at the Blackburn Bankruptcy Court, on May 6th. He attributed his failure to keen competition and loss of money through a former employé. He stated that he commenced his business in 1920 with £80 of his own, and he borrowed £100 from certain trustees, which was still owing. The Registrar ordered debtor to prepare an account showing his position with regard to his benefit under a family estate, and a new deficiency account, the one prepared being inaccurate and insufficient in several particulars. The examination was adjourned

S. T. HOSKEN, wireless accessories manufacturer and factor, 153, Fleet Street, E.C.—Receiving order made May 1st on debtor's own petition. First meeting, May 19th; public examination, July 10th, both at Carey Street, W.C.

J. L. JENSEN (Jensen & McNicol), wireless accessories factor, 149a, Seabank Road, Wallasey, Chester.—Receiving order made May 2nd on debtor's own petition.

W. A. HUNTLEY, X-ray engineer, 62, Albion Street, Leeds, lately carrying on business at 1030, Manchester Road, Bankfoot, Bradford, and 2-4, Church Street, Buttershaw, Bradford. —Receiving order made April 30th on debtor's own petition. First meeting, May 18th, at the County Court, Harrogate. Public examination, July 17th, at the Court House, Harrogate.

J. KAINE-FISH, wireless instrument maker, "Sempolia," West Green Road, Tottenham, N.—Trustee, Mr. T. Gourlay, 29, Russell Square, W.C., released April 27th.

S. L. BAPTY AND N. MILES (The Wireless Instrument Manufacturing Co.), wireless instrument manufacturers, Avenue Works, Avenue Road, Willesden Junction, N.W.—Last day for proofs for dividend, May 20th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

G. H. DIXON, electrical contractor, 4, Woodville Road, Leeds Road, Dewsbury.—Last day for proofs for dividend, May 19th. Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford.

L. L. JAMES (W. G. James & Son), electrical engineer, 62, Canterbury Street, Gillingham, and 137, High Street, Rochester.—First and final dividend of 8d. in the £, payable at 4, Charterhouse Square, E.C.

J. ADDY, lately wireless and cycle dealer, Bridge End, Long Preston, Yorks.—Receiving order made May 6th, on debtor's own petition.

VARLEY RADIO CO., dealers in wireless apparatus, 178, Ancona Road, Plumstead, S.E.—Receiving order made May 5th, on creditor's petition.

J. E. LOCKING, dealer in cycles and wireless goods, 14, Fish Street, Kingston-upon-Hull.—Receiving order made May 4th, on debtor's own petition.

J. MICHAEL, electrical engineer, 6, Sneyd Terrace, Silverdale, and 201, George Street, Newcastle-under-Lyme.—Trustee, Mr. E. E. Deane, Official Receiver, released May 1st.

N. WILLIAMS, M. WILLIAMS & W. COOK (British Radiophone Co.), makers of wireless apparatus, Downing Street, Bulwell, Nottingham.—Trustee, Mr. L. A. West, Official Receiver, 4, Castle Place, Nottingham, released April 30th.

J. H. WHITEHOUSE, electrical engineer, 61, Martin Street, Morriston, Swansea.—Trustee, Mr. H. Rees, Government Buildings, St. Mary's Street, Swansea, released May 1st.

Company Liquidations.—C. & B. DAWSON & BROS., LTD., wholesale radio manufacturers, late 14 and 16, Farringdon Road, E.C.—A meeting of creditors of this company was held on May 6th, at the offices of Messrs. Corfield & Cripwell, Finsbury Pavement, E.C. The chair was occupied by Mr. W. A. J. Osborne, who stated that he had been appointed liquidator in the voluntary liquidation of the company. Mr. Osborne submitted a statement of affairs which showed liabilities of £1,843, of which £1,781 was due to the trade and £62 was in respect of rent. The assets were estimated to realise £525, from which had to be deducted £4 for preferential claims, leaving net assets of £521, or a deficiency of £1,322. Mr. Osborne said that there was a doubtful debt of £632, representing an amount which was owing by Hamilton Bros., Ltd., for goods supplied. There had been considerable dealings between the two companies, and he had valued the debt at £50. There was a receiver in possession of the assets of Hamilton Bros., and that company had also gone into liquidation. Dawson & Bros. had suffered through burglaries. Fortunately a summary of the stock was available and he was making a claim on the insurance company, which he believed would be met. The company had only commenced business in the latter half of last year. The books had been fairly well kept, and it appeared that the purchases were £11,556 against sales of £11,084. The gross profit had only been £118. The directors attributed that small profit to the serious loss which had been incurred on certain of the lines stocked, more particularly h.p. batteries and valves. It was also said that there had been losses through leakages of stock. The expenses of the business had totalled £1,111, with the result that there had been a net loss on the trading since the commencement, of £947. The company was registered on October 21st, 1924, with a nominal

capital of £2,000, of which £500 was issued for cash. The company's efforts to get on to the N.A.R.M. list were unsuccessful. The company never did any manufacturing, but carried on a factoring business.

A creditor asked why liquidation had been decided upon. Mr. OSBORNE replied that creditors had commenced proceedings and it became necessary to protect the assets.

In reply to a question, the chairman said that the transactions with Hamilton Bros. were rather involved. As far as he could ascertain, there were sales to Hamilton Bros. to the extent of £2,106, but Hamilton Bros. also sold to Dawson and Bros. He had not examined the prices at which goods were sold to Hamilton Bros., Ltd.

A resolution was passed confirming the voluntary liquidation of the company with Mr. Osborne as liquidator, and a committee of five of the creditors was also appointed.

The following are the principal creditors :—

	£		£
Brand, S. (...	31	Kent Bros. Electric Wire Co. ...	22
Constructions Electriques (Paris)	81	Lissen, Ltd.	214
Dubilier Condenser Co.	240	Line, F., & Co.	25
Ericsson Mfg. Co., Ltd.	42	Oldham & Sons, Ltd.	95
Eastern Transport Co.	27	Power Equipment Co., Ltd. ...	57
Energo Products, Ltd.	69	Rosen, E., & Co.	84
Ferris, Ltd.	80	Radio Communication Co., Ltd.	24
Fuller's United Electric Works, Ltd.	57	Sachs, R. (Berlin)	104
		Speedwell Gear Case Co. ...	20
Fenwyn Gilbert & Co.	51	Thindgauld, J., & Co.	25
Forno Co.	35	Vandervell, C. A., & Co. ...	38
Hearns, A.	22	Zeiller, V., & Son	27
J.W.B. Wireless Co.	39	Finsbury Borough Council ...	29

JOHN R. KINSEY & Co., LTD., 350, Lower Addiscombe Road, Croydon, electrical engineers.—The first meeting of creditors was held on May 7th. It was stated that the statement of affairs had not yet been lodged, but according to a draft statement the ranking liabilities were £3,422, against assets of £1,824, from which had to be deducted preferential claims, leaving net assets of £1,474. From this amount had to be deducted loan on debenture bond £918, reducing the net assets to £555, and leaving a deficiency of £2,866. The company was registered in January, 1922, for the purpose of taking over the business previously carried on at Lower Addiscombe Road, Croydon, under the style of John R. Kinsey & Co. In October, 1924, a judgment was obtained for £600 and taxed costs (about £50) for personal damages received from one of the company's vans. The company was unable to meet these claims, and in November, 1924, a resolution was passed for the voluntary liquidation of the company. The voluntary liquidator was appointed by the High Court receiver and manager for the debenture holder and had since realised most of the assets of the business. The creditors decided to appoint Mr. Frank Clemens, C.A., 36, Chancery Lane, W.C., to act as liquidator, with a committee of inspection, consisting of Mr. H. Satchell (Kenley), Mr. G. A. O. Miller (Leigh-on-Sea), and Mr. J. E. Leyton (London).

BURNDEPT, LTD. (Old company.)—Winding up voluntarily. Joint liquidators, Mr. W. W. Burnham and Mr. P. J. Chaplin, both of Aldine House, Bedford Street, Strand, W.C. Meeting of creditors, May 20th, at Aldine House.

COMPRESSION STARTER & SWITCHGEAR Co., LTD.—Winding up voluntarily. Liquidator, Mr. J. Abson, 5, Beechwood Avenue, Romiley, Cheshire. A meeting of creditors was called for to-day at the registered offices of the company. (The above notice is formal; all creditors have been or will be paid in full.)

ELECTROLITE, LTD.—Winding up order made by the Croydon County Court on April 29th.

Private Arrangements.—WALTER ASHWORTH, electrical and radio engineer, 64, Higher Bridge Street, Bolton.—A meeting of the creditors of the above was held on April 30th, when a statement of affairs was presented which showed liabilities of £1,404, all of which was due to unsecured creditors. After allowing £2 for preferential claims, the assets were estimated to realise £183, leaving a deficiency of £921. It was reported that the debtor purchased the business from the Official Receiver in February, 1922, for £300, borrowing the money from his mother. Accounts had been kept, and it appeared that during the year to February, 1923, there was a loss of £186 on the trading. In January, 1924, there was a fire on the premises, and all the records except the private ledger were destroyed. The stock was valued at £700 by the assessors, but as the debtor was only insured for £500 he estimated that he sustained a loss of £332. The drawings had been moderate. It was decided that the matter should be dealt with under a deed of assignment, with Mr. J. Morris, of Bolton, as trustee. The following are the principal creditors :—

	£		£
General Electric Co., Ltd. ...	34	Ashworth, Mrs.	600
Wild, J. E.	36	Chadwick, James	125
Baxendale & Co., Ltd.	48	Bankers	25

A. T. K. MOIR, trading as Moir & Watts, Weardale Road, Lee, S.E.13, electrical engineers, &c.—A meeting of the creditors of the above was held on May 4th, at the offices of Messrs. Poppleton, Appleby & Hawkins, 4, Charterhouse Square, E.C., when a statement of affairs was presented which showed liabilities of £1,907, made up as follows:—Trade creditors, £1,207; bank, £250; cash creditor, £350; and outstanding costs, £100. The assets were set down at £3,421, giving a surplus of assets over liabilities of £1,514. Mr. E. H. Hawkins reported that the debtor commenced trading in 1908 at his present address, with a capital of £200 and the business was subsequently extended. During 1919 the turnover was £5,866, and the net profit £302. The following year the sales rose to £9,034, with a net profit of £565. In 1921 the turnover went up to £11,958, with a net profit of £440. The following year the sales dropped to £7,309, but there was a net profit of £649. In 1923 the sales were £6,772, and the net profit £811. In 1919 the debtor's capital stood at £460, but by 1923 it had been increased to £2,115, certain amounts having been paid into the business by him. Detailed figures for the turnover last year were not available, but it is understood that during that period the turnover was about £8,000, and there was a loss on the trading. The capital at the end of last year stood at £1,477. The loss was largely the result of a contract which was carried out at Dover. The debtor believed that he could continue the business successfully, and pay off all his liabilities. There were a number of pressing creditors; four or five executions had been levied, and a petition had been filed by the largest creditor, the Electrical Supplies Co. It was decided that subject to the execution creditors withdrawing a deed of assignment should be executed to Mr. E. H. Hawkins, with a committee consisting of Messrs. E. D. Young (Electrical Supplies Co.), E. Judd (Corfields Traders' Association), Metropolitan Vickers Electrical Co., C. Latham (Edison Swan Electric Co., Ltd.), and the cash creditor. It was also agreed that if the execution creditors would not withdraw, the bankruptcy proceedings should be continued, and if a receiving order was made the Official Receiver should be asked to appoint Mr. Hawkins as special manager with a view to the business being continued.

HART & HUTTON, 181, London Road, West Croydon, electrical engineers.—A meeting of creditors was held on May 6th at the offices of Messrs. Jarvis & Co., Bishopsgate, E.C.2, when Mr. G. C. Jarvis reported that a deed of assignment had been executed by the debtors and was registered on May 2nd in his favour. The statement of affairs as at April 28th, showed liabilities of £180, all due to unsecured creditors. There was a secured creditor for £250, and he held as security a mortgage on the lease of the premises which was valued at £400. The assets totalled £220, from which had to be deducted preferential creditors for rates amounting to £22, leaving net assets of £198, or a surplus of assets over liabilities, subject to the costs of realisation, of £18. It was decided to confirm the deed of assignment, and a committee of inspection was also appointed. The creditors include the Enterprise Mfg. Co. (£33), and Falk, Stadelmann & Co., Ltd. (£21).

Trade Announcements.—MESSRS. METRO-VICK SUPPLIES, LTD., have removed from 5, Albion Street, Leeds, to new premises at No. 9, East Parade, Leeds (Telephone : "27358/9 Central"; Telegraphic address : "Multiphase, Leeds"), where the showrooms will contain a special display of electric light fittings, including the Harcourt designs, Cosmos fans, electrical domestic appliances, and all standard lighting and power accessories. Cosmos radio sets, valves and components will be stocked and demonstrated.

In future "B. & K." electric cooking apparatus, formerly manufactured by the Brompton and Kensington Accessories Co., Ltd., will be manufactured at the Cosmos Factory, Brimsdown, of the METRO-VICK SUPPLIES, LTD., arrangements having been made for the latter to take over this apparatus. The B. & K. Co. is not a manufacturing company in the ordinary sense, and it has no selling organisation; it has placed the whole of its experience at the disposal of the Metro-Vick Supplies, and the latter will produce the apparatus on a large scale.

MESSRS. HOOPER & STONES announce that they have commenced business at Central Chambers, Long Eaton, as wholesale electrical suppliers, and they ask for catalogues, &c.

THE TRENT ELECTRIC WIRE WORKS, LTD., has opened an office at 3-7, Southampton Street, Strand, W.C.2 (Telephone : Gerrard 4869), under the direction of Mr. C. L. Elvy.

Mr. H. S. SMITH has taken over the entire control of the Silchester Electric & Radio Stores, Hastings, and the business will be carried on under his name.

MESSRS. PHILIPS LAMPS, LTD., have opened branch offices for North-East and North-West England at Manchester and Newcastle, where every type of their lamps will be stocked. The Manchester address is King Street West (2 & 3, Lofthouse Court); and that at Newcastle-on-Tyne is 30, The Handyside Arcade, Percy Street. Other branches in important provincial centres will be opened shortly.

MESSRS. FERRANTI, LTD., have this week removed from Fleet Street to Bush House, Aldwych, London, W.C.2.

The address of MESSRS. T. HOOD & Co., LTD., engineers, is now 40, Queen's Road, Bristol.

MESSRS. MCKEAND & FOULGER, electrical and motor engineers, who are removing to larger premises at Larkhill, Blackburn, wish to receive catalogues of electrical and wireless goods.

MESSRS. HENRY WIGGIN & Co., LTD., have now taken their own London office at Victoria Station House, S.W.1, and from May 18th all communications should be sent there. Mr. Lionel Robinson, for many years their London agent, becomes their London manager, but he will continue his factoring business (Lionel Robinson & Co.), at 3, Staple Inn.

MR. P. MILLER, who is commencing as an electrical and wireless contractor at 120, High Street, Auchterarder, asks for trade price lists of electrical and wireless goods.

MESSRS. KASENIT, LTD., have removed to Henry Street, Bermondsey Street, London, S.E.1.

Catalogues and Lists.—WESTINGHOUSE ELECTRIC & MANUFACTURING CO., East Pittsburgh, Pa., U.S.A.—A series of illustrated pamphlets describing the company's products—mine pumps, electric furnaces, electric drives for factories, &c.

MESSRS. FERRANTI, LTD., Hollinwood, Lancs.—Leaflet T1493, illustrating examples of the company's transformer installations.

THE "MONITOR" PATENT SAFETY DEVICES, Wallsend-on-Tyne.—An illustrated booklet containing notes on the safe working of air compressors.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—A series of leaflets containing revised particulars and prices of the company's products, including motors, oil circuit breakers, magnetic brakes, outdoor sub-stations, meter-testing equipment, transformers, &c.

MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, W.C.2.—Pamphlet No. 235, describing very fully the company's public speech and music amplifying system; and Leaflet No. 1,027, dealing with the "Marconi" 6-kW "Type U" transmitter.

METRO-VICK SUPPLIES, LTD., 4, Central Buildings, Westminster, S.W.1.—An illustrated folder containing details of "Cosmos" radio valves. Priced.

MESSRS. VERITYS, LTD., Aston, Birmingham.—A booklet containing 24 illustrations. The majority are views of the company's works, but a number of them show vessels to which the company has supplied apparatus, &c.

PHILIPS LAMPS, LTD., 60, Wilson Street, Finsbury Square, E.C.2.—A price list of vacuum and gasfilled lamps.

THE CONSTRUCTIONAL ENGINEERING CO., LTD., Titan Works, Charles Henry Street, Birmingham.—Booklet No. 133, illustrating and describing "Titan Cupolettes" and equipment for small foundries.

THE ELECTRO DYNAMIC CONSTRUCTION CO., LTD., Malt Street, S.E.1.—List No. 90, giving details and prices of portable air compressors.

IRON & NICKEL BATTERY CO., LTD., 301, Abbey House, Victoria Street, S.W.1.—An illustrated leaflet advertising the "Ionic" accumulator, and a reprint describing electric vehicle trials in which "Ionic" batteries were employed.

THE GLOBE ENGINEERING CO., LTD., 48, Watling Street, E.C.4.—List No. 11, illustrating and describing battery charging plant, motor generators and switchboards.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—May stock list of motors and dynamos.

Book Notices.—"Notes on Preparing a Tender," by R. I. Money, M.Inst.C.E. (48 pp.) London: The Society of Engineers (Inc.). Price 3s. post free.—This is a reprint from the *Transactions* of the Society. It describes the various methods used in estimating; the essential data required; bases of labour costs; materials and transport, &c. Although a railway tender is taken as an illustration, the methods can be applied in other directions.

"Connecting and Testing Direct-Current Machines," by F. A. Annett and A. C. Roe. Pp. x+237; 172 figs. Price 12s. 6d. "Lighting Fixtures and Lighting Effects," by M. Luckiesh. Pp. xiii+330; figs. 158. Price 20s. "Telephone Communication," by C. A. Wright and A. P. Puchstein. Pp. xvii+515. Price 25s. London: McGraw-Hill Publishing Co., Ltd.

"The *Electrician* Annual Tables of Electricity Undertakings." Pp. iv+173. London: Benn Bros., Ltd. Price 10s. 6d. post free.—The 38th edition of these tables has been expanded, and the number of undertakings now listed is over 2,000. The additions include lists of the smaller undertakings in Jugo-Slavia and Rumania.

"Ether and Reality," by Sir Oliver Lodge, F.R.S. Pp. 179. London: Hodder & Stoughton, Ltd. Price 3s. 6d. net.

"The Cost of Freight Transport by Railway," by F. W. Rogerson, Grad.Inst.T. (Pp. 39.) Published by the author at 27, Pembroke Place, Liverpool. Price 4s. 4d., post free.—As explained in the preface, the object of this book is to examine the elements of railway operating expenses and to describe methods of procedure in the development of a cost accounting system, particularly with respect to the determination and application of overhead charges.

"Kelly's Directory of the Merchants, Manufacturers and Shippers of the World, 1925." Two vols. Pp. cccvi + 2,610 and cxvi + 2,200. London: Kelly's Directories, Ltd. Price 64s. post free.—This is the 29th edition of this colossal directory, which deals with 20,000 foreign and colonial cities and towns, and contains over 1¼ million entries under the trade descriptions. The first volume gives information relating to foreign countries and their dependencies, while the other is devoted to traders within the British Empire. The sub-classification is designed to facilitate reference, and exhaustive indices, in five languages, also render aid in this direction.

"Illuminating Engineering," by F. E. Cady and H. B. Dates. Pp. xiii + 486; figs. 162. London: Chapman & Hall, Ltd. Price 25s. net.

"Practical Handbook on Electro-Plating," Ninth Edition. Pp. xiv + 269. Illustrated. Birmingham: W. Canning and Co., Ltd. Price 4s. 6d. post free.

"Practical Water Power Engineering," by W. T. Taylor. Pp. vii+270; figs. 32. London: Crosby, Lockwood & Son. Price 36s. net.

The New Rating Bill.—The text has been published of the Rating and Valuation Bill which is being presented to Parliament by the Minister of Health (Mr. Neville Chamberlain). The Bill aims at the simplification of the existing system, and to this end transfers the powers and duties of overseers of the poor in connection with rating to the usual local authorities. The principle of consolidation of rates which is at present in force in a few boroughs is to be extended generally. As regards machinery, an effort is made to place this on a more satisfactory basis by a stricter and more uniform classification. Certain classes of machinery, such as power plant, tramway tracks, &c., are to be considered as forming part of the rateable hereditament, and will pay rates in full. Machinery apart from these classes will be excluded from valuation.

Czecho-Slovakian Import Exemptions.—According to a list published in the *Board of Trade Journal*, the goods which are not subject to licence or declaration when imported into Czecho-Slovakia include:—"Hardened india rubber in sheets, rods or tubes, polished or not"; wire cable of base metal or alloys thereof"; and "electric carbons for lighting purposes, weighing 1 kg. or less per linear metre."

District Industrial Councils.—We have received a copy of the report of the District Industrial Council for the Electricity Supply Industry No. 5 (West Midlands Area) for the year ended April, 1925. This makes reference to the national demand by the employés of supply undertakings for an increase of 10s. per week, which was refused by a special tribunal. The District Councils were asked to consider the matter in the light of conditions in their respective areas, and the West Midlands Council decided to restore the "super-cut" of 2s. 6d. which was made in 1923 (1s. 3d. in the case of youths under 21). The report contains a table showing the effect of this and other wage changes upon the general rates of pay, and compares the existing rates with those of July, 1920. The financial statement reveals a satisfactory position. The report expresses the Council's thanks to Mr. R. A. Chattock (chairman) and Mr. E. J. Jennings (secretary and treasurer) for their services.

The annual meeting of the No. 11 District Industrial Council was held at Worthing on April 29th, when Councillors A. L. Tindall and T. Cochrane, both of Brighton, were elected chairman and vice-chairman respectively.

New Canadian Companies.—The Gatineau River Power Co., Ltd., has been incorporated in Quebec with a capital of $340,000.

In Ontario a company with a capital of $150,000 and the title Electric Steam Radiators, Ltd., has been formed.

Another recently-incorporated Ontario concern is the Christian Electric Co. of Canada, Ltd. This company has a capital of $60,000, and intends to deal in and manufacture electrical machinery.

Halifax Corporation and Contractors' Discounts.—The Halifax Town Council, last week, in the face of opposition, approved by a large majority an Electricity Committee recommendation that an allowance of 15 per cent. be granted to contractors in connection with the sale of electrical appliances from the Electricity Department showrooms. The opposition was on the ground that the discount was not large enough, but Alderman Hey (Chairman of the Committee) said that if the electrical traders had got all they wanted there would have been nothing left for the Corporation.

Underfeed Stoker Contracts.—Among recent contracts received by the UNDERFEED STOKER CO., LTD., for its manufactures, are the following:—Travelling grates for electricity works: Plymouth (8), Edinburgh (4), Falkirk (2), Isle of Thanet Electric Supply Co. (1), Slite (2), and St. Helens (4). Ash conveyors: Southport and Wakefield electricity works. Suspended arches: Poplar, Plymouth, Bedford, St. Pancras and Edinburgh.

Unemployment.—There was a decrease of 15,670 in the number of unemployed registered on April 27th, the total at that date being 1,187,000. The increase for the twelve months was 139,220.

According to the *Financial Times*, the number of unemployed in Germany on April 15th was 394,292, as compared with 514,576 on March 15th. Unemployment is at the lowest level since the early months of 1923.

Austrian Railway Electrification Loan Banned.—The *Financial Times* reports that the Control Commission has refused to allow the Austrian Government to raise a loan for the electrification of the State railways.

Visit to Metropolitan-Vickers Works.—The boys of the Young Australia League who have recently been making a tour of the country should receive very favourable impressions of British electrical engineering practice and capabilities. Among the many large works to which visits have been paid are those of the Metropolitan-Vickers Electrical Co., Ltd., at Trafford Park, where the boys saw a number of large electrical machines in course of manufacture.

Income Tax on Reserves.—Replying to suggestions that only half of the standard rate of income tax should be imposed upon that part of a company's profits which was placed to renewal and development reserves, Mr. Churchill, in the House of Commons on May 5th, said that the loss of revenue if this were done would be £23,000,000. If the concession were given only to manufacturing, mining, shipping and construction companies, the loss would be about £14,000,000. The figures were, however, based on limited information.

The British Empire Exhibition.—The Exhibition was re-opened by His Majesty the King, accompanied by the Queen and Prince Henry, on Saturday last, May 9th. The opening ceremony was broadcast from all stations of the British Broadcasting Co., and the arrangements proved very successful. From our readers' point of view (as electrical men) the show is not of such interest as the original exhibition, although electricity, naturally, enters largely into the successful working of the Exhibition. From the non-business aspect they may find it more attractive, for the spectacular side of the show has been considerably improved. The special lighting, which was mentioned in our issue of March 27th (p. 519), is largely responsible for this.

The former Palace of Engineering has been re-named; it is now the "Palace of Housing and Transport," and electrical apparatus has but a small representation. The Edison Swan Electric Co., Ltd., has retained its last year's stand; the London, Midland and Scottish Railway Co. has a large locomotive exhibit; and the Metropolitan Railway Co. shows a complete electric locomotive, a passenger car, and operating gear. Other firms who display their products at the Exhibition are:—The "Attracta" Electrical Co., the Changeable Sign Co., the Fastnut Co., Wm. Geipel & Son, Litholite Insulators, Ltd., the Magnetic Separator Co., Gent & Co., Ltd., and Prince's Electrical Clocks, Ltd. In the Palace of Industry the Relay Automatic Telephone Co., Ltd., has a working automatic exchange.

South Africa and Imperial Preference.—Mr. Havenga, the Finance Minister of the Union Government, announced in the House of Assembly on May 4th, that Great Britain would receive most-favoured-nation treatment under the new customs tariff.

About the same time representations with regard to the Union Government's alleged intention to abandon Imperial preference were made by the Federation of British Industries. The Federation emphasised the importance of Great Britain being an open market for South African goods, and pointed out that the Union of South Africa, in common with other members of the Empire, had obtained valuable concessions in the recent Budget, and that Great Britain made the utmost efforts to obtain most-favoured-nation treatment for the Dominions in any treaties which were made with foreign powers.

Electric Cranemen's Strike.—A strike of 120 electric cranemen at the Queen's Island Shipyard, Belfast, occurred recently. The strike lasted several days and involved the standing-off of over 3,000 men. The men eventually decided to resume work on May 7th pending negotiations with regard to their claim for increased wages.

Local Exhibitions.—HASLINGDEN.—The Corporation Electricity Department recently held a successful exhibition at the Public Hall. A number of the leading electrical firms participated in the display, including Belling & Co. (electric fires), Hotpoint Electric Appliances Co., Ltd. (small domestic appliances), the Falkirk Iron Co., Ltd. (cookers), Carron Company (cookers), the General Electric Co., Ltd. (electric washers, &c.), Hoover, Ltd. (suction cleaners), the Credenda Conduits Co., Ltd. (cookers), the British Thomson-Houston Co., Ltd. (lighting fittings, rectifiers, &c.), and the Jackson Electric Stove Co., Ltd. (cookers, wash boilers, &c.). A number of local firms also exhibited, including Messrs. Hindle, Son & Co., Mr. T. Smith, Mr. W. F. Thacker, Messrs. J. Stevenson & Co., Mr. J. Cooper, Mr. W. H. Good, and Messrs. Leicester & Holt. A number of lectures on and demonstrations of electric cooking, industrial and shop-window lighting, &c., were given during the run of the show.

WOKING.—To stimulate the use of electricity in Shepperton, which it has recently added to its area, the Woking Electric Supply Co., Ltd., is holding an exhibition at which the many uses of electricity are demonstrated. The show was opened on Tuesday last and closes to-day (Friday).

KINGSTON-ON-THAMES.—An electric cooking and heating exhibition recently held by the Kingston-on-Thames Corporation Electricity Department, at the showrooms of Messrs. W. H. Gaze & Sons, Ltd., 19/23, High Street, proved a popular attraction, and visitors came from a wide area. Cooking of every description was demonstrated on "Jackson" and "Tricity" cookers, and tests carried out during the exhibition on each of the cookers mentioned proved most encouraging. In each case a normal dinner for six to eight people was cooked with a consumption in each case of not more than 3 kWh. Each dinner comprised a joint of approximately 5 lb., two vegetables, a fruit pie and a Yorkshire pudding.

Many other electric cooking and heating devices were the subjects of demonstration, including kettles, toasters, radiators, geysers, &c.

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It is interesting to know that at 1.5d. per kWh, electricity for cooking has been in great demand in Kingston during the last few months.

Chinese Notes.—The Great China Electric Supply Co. has recently been started in Shanghai with a sales office at 333, Avenue Edward VII.

A group of Szechwan capitalists has formed the Kwanhsien Water-Power Electric Co. to exploit the water power in the the district. A site for the power station has been acquired.

The Shanghai Chinese Tramways Company has decided to construct two new lines in the city.

Shop-Window Lighting Contest.—One of the features of this year's Shopping Festival at Cardiff was a shop-window lighting competition. Two silver cups were offered as prizes, one by the Cardiff Electricity Department and the other by the British Electrical Development Association. Twenty-one entries were received, and the task of adjudication was confided to Mr. C. G. Morley New, the City Electrical Engineer, and Mr. W. E. Bush, manager of the E.L.M.A. Lighting Service Bureau. The judges evolved a very scientific method of awarding marks based upon the correct intensity, freedom from glare, colour, originality, &c. Mr. H. Collins was adjudged to have the best display, and was awarded the suburban cup. The city cup was gained by Messrs. S. Andrews & Sons, Ltd., confectioners. The value of good shop-window lighting was demonstrated by the crowds which gazed at Mr. Collins's display, to the neglect of other windows in the vicinity.

Fluid Synthetic Resin.—In a circular sent to the shareholders, the directors of the British Cyanides Co., Ltd., state that the business is still adversely affected by depression, but it is hoped that a new development upon which the company has embarked will prove successful. This is the production of what is claimed to be the first fluid synthetic resin put on the market—an odourless, colourless and transparent substance. A new company styled "The Beetle Products Co., Ltd.," has been formed to purchase the company's output of this synthetic resin and develop some of the industrial uses to which it can be put.

The circular also states that the company's experiments in the fixation of atmospheric nitrogen are not to be resumed at present.

South African Government Purchases.—The decision of the Government of the Union of South Africa to order all its goods locally instead of making purchases through the office of the High Commissioner in London, except where the supplies are unobtainable in South Africa, is hailed as a beneficial step by American exporters. *Commerce Reports* says that under the new policy it is expected that American manufacturers will be able to share in Government business to a much greater extent than was possible in the past. A list is given of the principal requirements of the Government, and in this are included such goods as cables, insulators, electrical material and machinery, and telegraph and telephone apparatus, boilers, &c.

United States Electrical Exports.—Exports of electrical goods from the United States during February, 1925, amounted to $5,039,436, according to preliminary figures. This is about $1,750,000 less than in the same month of 1924, although higher than February of both 1923 and 1922. Large declines are noted, when comparing with February, 1924, in a.c. generators, batteries, transformers, power switchboards, meters, fuses and fuse blocks, protective apparatus, motors, fans, lamps (other than metal filament), railway signals, insulating material, fixtures, line material, porcelain, and insulated wire and cable, both iron and copper. Considerable increases were shown in metal-filament lamps, flash lamps, motor-driven household devices, domestic heating and cooking devices, therapeutic equipment, radio apparatus, globes and shades, and bare copper wire.—*Commerce Reports.*

The Silk Duty and the Electrical Industry.—In a recent letter to *The Times*, Mr. S. M. Le Goy says:—"The discussions and protests on the proposed new duty on natural silk have centred on luxury articles—stockings, dresses, &c. Pure silk is, however, used in large quantities in the electrical industry, for wire insulating. The proposed duty will affect all branches of the electrical trade. Electricity is not a luxury, and the cost of all electrical installations and instruments will greatly increase if the duty is enforced on pure silk, which has to be imported." One branch of the industry which may be affected is silk shade manufacturing, which has reached very big proportions.

A Hungarian Combination.—It is announced from Budapest that a community of interests is being established between the Telephone Works Co. of Budapest and the United Glow Lamp & Electricity Co. of New Pesth, in the sense that a Swiss company, in which the United Company is interested, has acquired the shares hitherto held by the largest shareholder in the Telephone Works Company. The object of the combination is to enable the export trade to be more successfully carried on in the face of foreign competition.

Australian "Dumping" Duties.—*Reuter's Trade Service* reports that action is being taken to render liable to "dumping" duties a number of classes of goods, including British static transformers, which are landed, duty-paid, at less than the manufacturer's selling price of comparable Australian products.

Manufacturing in Belgium.—The report of the directors of the Ateliers de Constructions Electriques de Charleroi, which has a share capital of 80,000,000 fr., states that during the first half of 1924 the excessive fluctuations in exchange brought about great variations both in the prices of products and in the requirements of customers. On the other hand the second half witnessed a relative stabilisation in exchange

and therefore in the costs of production. As the enforced abstention of customers during the period of uncertainty caused an accumulation of requirements, it was possible for the company to record a considerable volume of orders as soon as the situation again became normal. The results obtained in the second half were entirely satisfactory, as was shown by the increase in the profits as compared with the previous year. Since the close of the year, however, a slackening of the demand had taken place as a consequence, principally, of the less favourable situation of certain branches of industry which were large consumers of the company's manufactures. The report also points out that the turnover will depend in a certain measure on the results of the negotiations now proceeding with various neighbouring countries with regard to the establishment of new Customs *régimes*. The maintenance of industrial activity and of national prosperity requires that Belgian industries should have in their own market a protection in proportion to the high tariffs which are found in other countries. Coming to consider the question of industrial activity in 1924, the report states that among the manufactures carried out or undertaken were numerous turbo-alternators of capacities higher than 10,000 kVA; two winding engines of 3,000 h.p. for the Charbonnages de la Campine, which will be the most powerful installed in Belgium; several alternators of 6,000 kVA, to be driven by waste-gas engines; and various motors of large powers for the direct driving of rolling mill trains. In the case of the cable factory the execution of important orders was undertaken for cables for 36,000 V, which represented the first underground transmission at this pressure in Belgium.

Norwegian Electrode Works.—Some time ago the Norwegian State acquired at an auction the undertaking of the Norske Elektrodeverker in Fredriksstad, the works being subsequently let for four months to a German company with the option of continuing trial working for a further period of 12 months. This period has now been entered upon and the Department of Commerce is to be authorised to make arrangements for the definite lease or sale of the works at the expiration of the 12 months.

Radio Valve Prices Reduced.—Substantial reductions in the prices of radio valves have been announced by the leading manufacturers. The companies whose valves are concerned are the Metro-Vick Supplies, Ltd., the Edison Swan Electric Co., Ltd., the General Electric Co., Ltd., A. C. Cossor, Ltd., the British Thomson-Houston Co., Ltd., the Western Electric Co., Ltd., and the Mullard Radio Valve Co., Ltd. The reductions, generally, range from 20 to 30 per cent., and in two or three cases they are greater than the latter figure. This is the second series of "cuts" made within the past few months.

In this connection we have received a copy of a letter sent by Mr. C. Culmer Hodges, engineer and secretary of the Dawlish Electric Light & Power Co., Ltd., to the Valve Manufacturers' Association. This letter complains that although the Association has notified its intention of allowing for the reduced prices in the case of all valves purchased since March 31st, many retailers may have bought heavily before that date and be left with large stocks which will have to be disposed of at an unprofitable price. Mr. Hodges says that if manufacturers reply that they cannot afford to allow for *all* valves purchased prior to the reduction they "should only reduce the price to the public to an extent that would leave sufficient margin to recompense the man who is stocking the goods."

The Burwood Electrical Supplies Co. (1924) informs us that it also has reduced the price of its "Puratone" valve.

Lead. — Messrs. James Forster & Co., in their weekly report dated May 9th, state:—"The future of the market is difficult to read. On the one hand, there is a prospect of full supplies, particularly from Australia, Canada, and U.S.A. Consumption, which is undoubtedly good (except in the electrical trade, where business is slack), can with difficulty absorb arrivals, and if this condition of affairs continues we cannot expect any advance in prices, but rather a market with a sagging tendency. On the other hand, any change in the tone of the American market and a revival of demand from the electrical trade would quickly alter the situation, and might easily turn the surplus into a shortage. We consider that the worst features have already been discounted, and, given a better trade demand, both here and on the Continent, we might easily see a sharp rise in values."

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from May 6th:—

Crystadyne. No. 449,445. Class 8. Apparatus for use in radio telegraphy and telephony.—John Scott-Taggart, Devereux Court, Strand, W.C.2.

The Phœnix (lettering and design). No. 456,270. Class 8. Electric batteries.—W. E. Stichling, trading as the Langham Electrical Supplies Co., 46, Parkhill Road, Hampstead, N.W.3.

Islet. No. 457,060. Class 8. Apparatus for use in connection with radio telephony and telegraphy and like purposes.—G. H. Cooke, 28, Dalmeny Avenue, N.7.

Kudos. No. 454,325. Class 8. Apparatus and parts thereof made wholly or partly of metal for use in radio telephony.—Christie & Hodgson, Ltd., 246, West Street, Sheffield.

Asca. No. 453,255. Class 13. Electric lamps (ordinary).—Associated Accessories and Lamp Works, Ltd., 11, Denmark Street, W.C.2.

Stabec. No. 456,895. Class 40. Electrical insulating substances made wholly or partly of rubber.—The New Eccles Rubber Works, Ltd.

CORRECTION.—The trade mark registered by the General Radiological & Surgical Apparatus Co., Ltd., is "Monopan," and not "Monophon," as recorded in our last issue.

Lighting and Power Notes.

Aberdeen.—ELECTRICITY EXTENSIONS.—It was stated at a recent meeting of the Town Council that the Electricity Commissioners had sanctioned the borrowing of £150,000 for extension of plant at the Corporation's generating station. The engineer was authorised to procure and submit tenders for the extension of the switchgear at a cost of £1,000 and to install new e.h.p. switchgear, to take the place of the existing apparatus, at a cost of £7,000. This expenditure will be provided for out of the reserve fund.

Argentina.—ELECTRICAL DEVELOPMENT.—Steady progress continues to be made by the Compania Hispano-Americana de Electricidad, of Buenos Aires, which is now supplying current to 184,628 consumers—representing 530,818 kW—an increase of about 20,000 during the past 12 months. During the year six new boilers and a third 25,000-kW turbo-alternator were completed and put into operation. A further six boilers and a fourth 25,000-kW generating set are in course of installation and are expected to be ready for work by August next, while a fifth 25,000-kW generating set, ordered in September, 1924, is expected to be delivered by the end of the year. The Hispano-Americana Co. also supplies current to the suburb of Avellaneda and to the Compania Argentina de Electricidad. At the end of last year 15,398 consumers were being supplied in Avellaneda, as against 11,947 in 1923, while the number of consumers of the Argentina company advanced from 13,962 to 16,060. In order to meet the growing demand, the Hispano-Americana Co. has had plans prepared for a super power station with a capacity of 500,000 kW. Work is in hand on the first portion of the plant, which will be of 125,000 kW capacity, and it is expected that it will be ready for operation early in 1928.

Australia.—PERTH (W.A.).—The accounts of the City Council's electricity undertaking (engineer: Mr. T. M. Carey) for the year ended September 30th last record a total revenue of £159,901, as compared with £153,208 in the preceding year. Working expenses totalled £97,167, and interest and sinking fund amounted to £28,584, leaving a net profit of £20,120, as against £35,836 in 1922-23. The sales of electrical energy increased from 13,473,716 to 17,199,639 kWh, and the maximum supply demanded rose from 4,000 to 5,160 kW. Electricity is purchased in bulk from the Government power station at East Perth.

Aylesbury.—LOAN.—The Town Council has applied for sanction to a loan of £6,000 for cookers and other electrical apparatus for the next three years.

OPPOSITION TO ORDER WITHDRAWN.—The Herts. County Council has withdrawn its objections to the Council's application for a Special Order to extend the area of supply, but reserves its right to take action at a later stage if found necessary.

Blackpool.—LOANS.—The Town Council is applying for sanction to the following loans:—£40,000 for e.h.p. and l.p. mains; £5,000 for transformers, switchgear, and four transformer buildings; £9,000 for services.

Bolton.—PURCHASE OF COOKERS.—The Electricity Committee has authorised the purchase of a further 100 electric cookers for issue on the hire-purchase system.

Colchester.—SPECIAL ORDER.—The Corporation has resolved that application shall be made to the Electricity Commissioners for a Special Order authorising it to distribute electricity in an extended area to comprise approximately the parishes within the Lexden, Winstree, and Tendring Unions.

Continental.—CZECHO-SLOVAKIA.—The Ministry of Agriculture has drafted a Bill authorising the Minister of Finance to devote 30 million Czecho-Slovak crowns within the next five years to supplying country districts with electrical energy, the object being to assist small farmers in backward districts, especially in the mountainous regions.—*Reuter* (Prague).

THE TYROL.—Work has practically been completed on the construction of the new Spullersee hydro-electric station, which is to supply the power for the electrified railway between Landeck and Bludenz, and the plant is expected to be put in operation shortly.

GERMANY.—Work has been completed on the construction of a large new hydro-electric station at Spichra, in Thuringia, for the supply of electricity to the towns of Eisenach, Erfurt, Jena, and other places in the district.

ITALY.—The new Brasimone power station of the Società Bolognese di Elettricità has recently been completed and put in operation providing Bologna with an additional supply of 10 million kWh per annum. At the end of last year the company was supplying electricity to 53,145 consumers, an increase of 5,000 during 1924. The sales during the 12 months amounted to 24,515,723 kWh, an advance of over 3½ million kWh.

FRANCE.—In view of the increasing demand for current and the impossibility of further extensions at the existing power station, the Société d'Electricité de Strasburg is establishing a large new steam-operated station at Alsace. The first plant will consist of six boilers—several of which will be adapted for firing by powdered coal—and two 15,000-kW turbo-alternators. The first unit is expected to be ready for operation by October next and the second a year later. The station is being planned for an ultimate extension to 170,000 kW.

BELGIUM.—A power station of a capacity of 12,000 kVA has recently been completed at the collieries of the Société des Charbonnages du Hassard, at Micheroux.

Croydon.—ELECTRICITY EXTENSIONS.—The Electricity Committee has recommended that the following extensions be carried out:—H.p. feeder from the electricity works to Crown Hill, £1,060; various mains extensions, £785.

HIRE OF DOMESTIC APPARATUS.—The Committee has also recommended the allocation of a sum of £4,500 for the hire, fixing, and maintenance of apparatus.

Dorchester.—NEW PLANT.—In connection with the development of the electricity undertaking, the Electricity Committee has recommended to the Town Council that in considering the installation of new plant, the principle of suction gas in preference to crude oil or any other system should be adopted, and that generating plant with a capacity of approximately 260 kW be obtained.

Greenock.—"ALL-ELECTRIC" HOUSES.—Following upon a favourable report by the Housing Committee, the Corporation has decided to build and equip four "all-electric" houses for experimental and demonstration purposes. The electrical installation in these houses will include electric lighting, fires, cookers, kettles, and wash-boilers. The Corporation has also accepted a recommendation by Mr. F. H. Whysall, the electrical engineer, that for "all-electric" houses the following rates for supply should be applicable:—Three-apartment house: 2s. 6d. per week, plus ½d. per kWh for all energy used. Four-apartment house: 2s. 9d. per week, plus ½d. per kWh. Five-apartment house: 3s. per week, plus ½d. per kWh.

India.—ELECTRICAL DEVELOPMENTS.—To increase the electricity supply, the Rangoon Tramways & Electric Supply Co. has, in addition to the considerable extension to the overhead and underground mains in the town area, extended the underground mains to Insein and the Government brickfields and new cantonment at Mingadon, to give a supply of energy in that area. The demand for energy continues to increase rapidly, and in 1924 the increase in the number of consumers was 512. Considerable extensions are also being made to the tramways, so that there will soon be a need of increased supply.

The Nagpore Electric Light and Power Co. is extending its mains in the city, and has also made arrangements to supply the railway companies with energy for lighting their stations, yards, &c. It is proposed to install modern and more economical generating sets.

The Municipal Board of Amritsar, in the Punjab, has applied to the Government for a loan of Rs. 12 lacs for the purpose of installing more powerful engines in the power house to supply electrical energy to the whole city.

The Dacca Electric Supply Co., in Bengal, has ordered a new engine and dynamo. The power-house building is being enlarged to take this new set, and various improvements and alterations are being made to the switchgear. Arrangements have also been made to feed the old power station by means of an alternating-current h.p. line.

Irish Free State.—DUBLIN.—The City Administrative Commissioners (acting in lieu of the Corporation which has been suspended) have included a sum of £2,000 in their estimates for the conversion of gas lamps to electricity.

It is proposed to lay a cable to the Governor-General's residence in Phœnix Park at a cost of £3,200.

Maidstone.—LOAN SANCTIONED.—The Town Council has received sanction to loans of £7,199 for extensions to the electricity works, and of £1,420 for a cooling tower and equipment.

Millom.—CORRECTION.—We are asked to state that the report published here last week is incorrect, and that Mr. L. B. Hogarth, borough electrical engineer of Whitehaven, is the engineer appointed to carry through the Millom electricity supply scheme.

Northern Ireland.—PORTSTEWART (Co. ANTRIM).—With the sanction of the Northern Ireland Electricity Commissioners, the Urban District Council has decided to borrow £2,500 towards the purchase of the local electricity works, taken over on May 1st. Sanction to a further loan of £2,500 for a new generating station has been postponed pending the receipt of plans, &c.

Nottingham.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. H. J. Talbot) for the year ended March 31st last show a total revenue of £328,171, as compared with £305,099 in the previous year. Working expenses amounted to £168,540, as against £159,669, leaving a gross profit of £159,631, to which was added a grant of £916 in respect of interest on loans raised for schemes approved by the Unemployment Grants Committee, making a total of £160,547. After payment of capital charges there was a net profit of £81,956, as compared with £85,133 in 1923-24, of which £35,000 was contributed towards the relief of the rates and £46,200 placed to the reserve fund. The electrical energy sold amounted to 24,229,974 kWh, an increase of 1,307,514 kWh. Electricity is now being supplied to consumers in Hucknall and Woodthorpe, and l.p. mains have been laid in West Bridgford, Arnold, Carlton, and Colwick. The plant at North Wilford power station, it is stated, is expected to be in operation by the end of the summer.

Peterborough.—HIRE OF DOMESTIC APPARATUS.—The Electricity Committee has recommended to the Council that electrical cooking apparatus be let out on hire to consumers at a rent of 6s. per quarter, and also that a charge of 1d. per kWh be made for electricity used for all domestic purposes other than lighting in substitution for the present charge of 2d. per kWh.

LOAN SANCTIONED.—Sanction has been received to the borrowing of £1,730 for street lighting.

Preesall.—LOAN.—The Urban District Council is applying for sanction to borrow £14,000 for the electricity scheme.

Preston.—ELECTRICITY SUPPLY.—The Corporation has agreed to supply electricity in bulk to the districts of Leyland, Farington, and Walton-le-Dale, and satisfactory progress is being made with regard to a supply to the Fylde coast towns of Blackpool, Fleetwood, and Lytham-St. Annes. A draft of a suggested agreement is now under consideration by the respective authorities. The extensions which have taken place and new consumers booked in the Preston area will increase the load on the Preston station from 3,000 to 8,000 kW. Apart from the natural expansion, there is 5,000 kW for Leyland; the 33,000-V mains now being laid between Preston and Blackburn, which will result in additional heavy supplies being passed between the two towns; and negotiations are proceeding providing for a minimum of 5,000 kW increased to 10,000 kW for the coast towns. Thus the load on the station already in prospect approaches 20,000 kW. The effective capacity of the Ribble station as at present equipped is only 12,500 kW. Extensions will therefore be required.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation the following Special Orders made by them:—Wirral and Neston Special Order, 1925, for the supply by Wirral Rural District Council in part of the rural district and the urban district of Neston and Parkgate; Alton Special Order, 1925, for the supply by Messrs. Crompton & Co., Ltd., in the urban district of Alton.

The Urban District Council of East Dereham has applied for an Order authorising it to supply electricity in the district.

Stamford.—ELECTRICITY CHARGES.—The charges for electricity supply by the Urban Electric Supply Co. have been varied by the Ministry of Transport at the request of the Town Council as follows:—Winter quarters: First 15 kWh, 1s. per kWh, and for subsequent consumption, 10d. per kWh. Summer quarters: First 10 kWh, 1s. per kWh, and 10d. per kWh thereafter.

Stretford.—LOAN SANCTIONED.—The Urban District Council has received sanction to a loan of £20,000 for the installation of coal- and ash-handling plant at the generating station.

Thornton.—ELECTRICITY IN BULK.—Following further correspondence with the Urban District Council respecting a bulk supply of electricity, it is reported that the Electricity Commissioners have suggested a joint meeting between Blackpool and Thornton authorities in London with a view to arriving at an agreement.

Watford.—LOAN SANCTIONED.—The Town Council has received sanction to the borrowing of £18,750 for mains, services, and meters.

Workington.—ELECTRICITY CHARGES.—In connection with the recently-inaugurated electricity supply, the Town Council has fixed the following charges for electricity:—Heating, 3d. per kWh; ordinary power, 2½d. per kWh; customers with 5-h.p. motors, running all working hours, 2d. per kWh; private lighting, 6d. per kWh, with certain discounts; kinemas, 3d.

Tramway and Railway Notes.

Australia.—NEW ELECTRIC RAILWAY.—According to the *Industrial Australian and Mining Standard*, the construction of an electric railway from St. Leonard's to Eastwood has been approved by the New South Wales State Parliamentary Works Committee. The scheme includes the construction of a bridge across Lane Cove River, and there will also be an extension of the line to the Northern Suburbs Cemetery. The length of the new railway will be about 8¼ miles, and it will branch off the North Shore line at a point north of St. Leonard's station. The estimated cost of the scheme is £649,000.

Barking Town.—LIGHT RAILWAY LEASE.—The Urban District Council proposes, under the provisions of the Barking Light Railways (Extension) Order, 1903, to execute to the East Ham Town Council a lease of the following light railways within the district:—From the boundary of the district at London Road adjoining the tramway of the East Ham Corporation, along London Road, North Street, and Broadway. The term of the lease is for 15 years from the completion of the reconstruction of the light railways.

Hartlepools.—PURCHASE OF UNDERTAKING.—The Hartlepool Town Council has decided, with regard to the negotiations with the West Hartlepool Corporation on the question of transport facilities between the towns, to exercise its statutory right under the Tramways Act, 1870, and purchase the tramways within the borough of Hartlepool at £6,500, a figure which the owning company has undertaken to accept. The Council has also reaffirmed its willingness to enter into a working agreement with West Hartlepool for a service of motor-buses on the through route.

Manchester.—SLEEPER TRACK.—The Corporation is laying a tramway track constructed on sleepers on the Princess Road extension Moss Side. Express cars will be run and a speed of 20 m.p.h. will be attained. Crossings will be provided for pedestrians at six points.

Morecambe.—BATTERY ELECTRIC 'BUSES.—The Corporation is considering the question of the introduction of battery electric 'buses, and has appointed a committee to obtain information on the matter and to prepare a report.

Nottingham.—YEAR'S WORKING.—The report on the working of the Corporation tramway undertaking (general manager: Mr. J. Aldworth) for the year ended March 31st last records a total revenue of £435,774, as compared with £410,398 in 1923-24. Working expenses totalled £327,710, an increase of £22,049, leaving a gross profit of £108,064 (£91,268), which has been disposed of as follows:—Interest on stocks and loans, £14,337; debt redemption, £30,640; income tax. £15,602; reserve, £32,484; relief of the rates, £15,000. The car-mileage, including 'bus mileage, was 5,407,642, an increase of 359,412, and the number of passengers carried increased by 7,240,871 to 72,008,663. It is hoped to introduce railless cars on the Nottingham Road section at an early date.

Southport.—OMNIBUSES.—The Tramway Committee is to arrange for the running for a period of one month of an experimental 'bus service along Westbourne Road, Grosvenor Road, and Waterloo Road to Ainsdale.

Stretford.—EXTENSION OF TIME.—The Urban District Council has given notice of its intention to apply to the Ministry of Transport for an extension of the period in which to complete the railways authorised by the Stretford Light Railways Order, 1906, and of Railway No. 10 authorised by the West Manchester Light Railways (New Lines, &c.) Order, 1906, by one year commencing June 15th, 1925.

Tramway Fares.—The following undertakings have received sanction to maintain increased fares under the Tramways (Temporary Increase of Charges) Act:—Until July 31st, 1925: The Yorkshire (West Riding) Electric Tramways Co., Ltd., and the Yorkshire (Woollen District) Electric Tramways, Ltd. Until December 31st, 1925: The Worcester Electric Traction Co., Ltd., and the Swansea Improvements and Tramways Co.

Wigan.—RAILLESS CARS.—The railless-car system, which has superseded the tramcars on one section of the Corporation tramway, was formally inaugurated by the Mayor on May 7th.

Telegraph and Telephone Notes.

France.—NEW TELEPHONE CABLE.—The laying has recently been completed by the French Post and Telegraph authorities of an underground telephone cable between Lyons and Saint Etienne, with branches to Rive-de-Gier, Givors, and Saint Chamond. The cable consists of 76 copper wires of 1 mm. diameter, and by the use of Pupin coils it is stated that 77 different conversations can be simultaneously carried on.

India.—MADRAS TELEPHONES.—Our correspondent in India reports that the results of the working of the Madras Telephone Co. for the year ending December, 1924, show a net profit of Rs. 163,000, and a dividend of 7 per cent. has been declared. At the end of the year there were 1,385 exchange lines, 805 extensions, and 43 private lines. The measured rate system was introduced during the year with much benefit to subscribers. The new exchange building will be completed within four months' time, and the automatic system will come into operation within 12 months. Large extensions of underground cable are in progress (1) to meet expected developments, and (2) to improve the electrical qualities of subscribers' lines in outlying areas, which is necessary in the case of automatic working.

Lithuania.—KOVNO RADIO STATION.—According to *Commerce Reports*, the construction work on the radio station at Kovno, which is in the hands of a French company, has been suspended owing to lack of capital. The chief of the radio station has requested the Government to appropriate a sufficient sum to complete the station, but it is doubted whether the desired appropriation will be made in the near future.

Police Telephones.—SUNDERLAND ECONOMIES.—By closing five divisional police-stations and adopting a system of police telephone boxes, Sunderland has saved £15,000 in one year. Each constable on a beat has a telephone-box. He rings for a motor-car when he has a prisoner for headquarters, and uses the box to detain his captive until it arrives. During the past year 10,232 calls were made from the boxes, including 574 for arrest by motor vehicle, 122 concerning fires, and 1,036 for doctors. So satisfactory is the system that it has been adopted, with modifications, says the *Evening News*, at Doncaster, Exeter, Middlesbrough, Rochdale, Tynemouth, Plymouth, Wolverhampton, and Torquay.

Ships' Radio Apparatus.—USE IN PORTS.—The Chamber of Shipping has been advised by the Postmaster-General that in future merchant ships may use their wireless installations in (*a*) the Naval Harbours of Portsmouth, Plymouth, Chatham, Sheerness, and Rosyth, and (*b*) the Port of London above Cross Ness (the lower extremity of Barking Reach) for the transmission of urgent ships' service messages, when they are unable to communicate with the shore by other means owing to stress of weather or other causes. Communication must be exchanged only with the nearest British coast station. The minimum power necessary must be used and no interference caused to other traffic. Communication must cease at the request of a Government or commercial station.

The Telephone Service.—LONDON HEADQUARTERS.—By the end of May the removal of the headquarters of the London telephone service from Queen Victoria Street across the river to Cornwall House, Stamford Street, will have been completed. The City premises, which have been the administrative centre since the beginning of the service, will be taken over by the engineering branch of the service.

CONTINENTAL EXCHANGE OPERATORS.—Two London telephone girls left on May 5th for a fortnight's visit to Paris. Later 2 other girls and three supervisors from the continental exchange will follow them, and corresponding parties of operators from the Paris exchange are visiting London. The Post Office authorities hope that the trip will give the girls a knowledge of the work at the Paris exchange and of the methods of "routing" calls to various parts of the country, in order to make for smooth working between the exchanges of the two capitals. The official language of the exchanges is French, which is used exclusively, so that the English girls of necessity speak it fluently.

WESTERN DEVELOPMENT.—As already announced, the Plymouth and Exeter districts have been amalgamated, with headquarters at Exeter; new exchanges are being opened at Nether Stowey and Stogumber, in Somerset; Lydford, Shirwell, Combemartin, and High Bickington, in Devon; the Lizard, St. Tudy, Chillaton, and St. Dominic, in Cornwall. Negotiations are proceeding for the establishment of 12 other exchanges in Cornwall and Devon, besides which a large number of call offices and farmers' lines are in course of erection.

Radio Notes.

Broadcasting Plays.—AGREEMENT REACHED.—An agreement has been drawn up between the British Broadcasting Co. and the various theatre managers' associations for the broadcasting of plays. One of the main clauses of the agreement is that not more than 26 plays, or one every two weeks, shall be broadcast, and that first nights shall not be transmitted. Each side conceded points, and the *Daily Mail* understands that under the present agreement only selected excerpts from plays shall be broadcast. It is understood that any plays deemed suitable for broadcasting by the programme manager of the British Broadcasting Co. will be available, but plays touring in the provinces will not be eligible.

European Broadcasting.—NEW STATIONS.—Broadcast reception in Great Britain is by no means confined to the programmes transmitted by stations in this country, and the number of Continental stations which can be received will soon be increased when those stations which are now in course of erection in Sweden and Spain by Marconi's Wireless Telegraph Co. are completed. The new stations are being erected at Stockholm and Madrid respectively, and are standard Marconi 6-kW type "Q" stations, similar to those erected for the British Broadcasting Co.'s main stations. The transmitter consists essentially of four panels, *viz.*: A rectifier, an independent drive, a main oscillator and a modulator. The use of the independent drive in the Marconi transmitters has been justified by the results achieved; it ensures the invariability of the carrier-wave frequency, and consequently lessens the need for altering the tuning adjustments at the receiver.

Radio Association. — REORGANISATION. — The Duke of Sutherland has been appointed president of the Radio Association. Lieut.-Com. J. M. Kenworthy, M.P., is chairman of the Committee, and the Association has been reorganised, says *The Times*.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the* ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—June 3rd. Victorian Government Railways. Supply of 2,200-V cable and spares.

Ashton-under-Lyne.—May 20th. Watch and Town Hall Committee. Rewiring the electric light installation at the Town Hall. Specification from Borough Electrical Engineer, Electricity Works, Wellington Road.

Belgium.—May 22nd. Association Intercommunale d'Electricité du Hainaut. Supply of electrical energy required for its distribution system. Particulars for 30 fr. from Service Voyer, 17, Rue du Gouvernement, Mons. Tenders to be addressed to M. le Gouverneur du Hainaut, Mons.

June 3rd. Belgian Post and Telegraph authorities, at La Salle Madeleine, Brussels. Supply and laying of telephone cables, with accessories, at Turnhout, Louvain, Malines, Vilvorde, and Wyneghem. Particulars (Cahier des Charges, Special No. 3-104) for 5¼ fr.

June 10th. Société Nationale des Chemins de Fer Vicinaux, 11, Rue de la Science, Brussels. Overhead electrical equipment of the Antwerp-Wyneghem-Schilde and Antwerp-Wommelghem local railways. Particulars for 5 fr. from Bureaux des Services Electriques, 45, Rue Montoyer, Brussels.

Bridlington. — May 20th. Electricity Department. Generator panel and switchgear for one 600-kW d.c. turbo-generator. (May 8th.)

Cheadle and Gatley.—May 18th. Urban District Council. E.h.p. switch cubicle and link compartment. Electrical Engineer and manager.

Darlington.—May 29th. Water Works Department. Six electrically-driven centrifugal or turbine pumps. (See this issue.)

Dublin.—G.N.R. (Ireland). May 21st. General stores for six months, including electric lamps, fittings, cable and wire, &c. (May 8th.)

Dundee.—May 18th. Tramways Committee. Stores, including armature coils, commutators, mica, &c., insulated wire, lamps, switches, materials for overhead equipment, &c., for 12 months. Specifications from general manager.

May 20th. Harbour Trust. Two 1½-ton electric overhead travelling cranes. Specifications, &c., from engineer.

The Education Authority invites offers for the installation of electric light at five schools. Specifications, &c., from Mr. John E. Williams, executive officer.

Eccles.—May 25th. Electricity Department. Twelve months' supply of a.c. meters. (See this issue.)

Egypt.—CAIRO.—July 1st. Public Works Department. Electrical pumping plant for a floating dock.*

June 24th. Egyptian State Railways, Telegraphs and Telephones. Supply of automatic telephones. Specification from the Inspecting Engineer's office in London.

Haddington.—May 18th. Western District Hospital. Electric light installation. Mr. George Sinclair, architect, 1, Court Street, Haddington.

India.—May 22nd. South Indian Railway Co., Ltd. Electric overhead travelling crane. Specifications (5s.) from the company's offices, 91, Petty France, Westminster, S.W.

India Store Department. May 21st. 25-kW oil-engine electric generating sets. (May 8th.)

May 22nd. Carsack elements for Leclanché cells (May 1st).

London.—BETHNAL GREEN.—May 20th. Electricity Department. One 1,000-kVA transformer. (May 8th.)

H.M. OFFICE OF WORKS.—May 28th. Electrical cable and flex. (See this issue.)

Luxembourg.—May 25th. Municipal authorities of Sensenruth-lez-Bouillon, Province of Luxembourg. Two transformer stations and a l.p. electricity distribution system for the town. Particulars for 50 fr.

New Zealand.—WELLINGTON.—July 7th. Post and Telegraph Department. Sub-station protectors.*

NAPIER.—August 10th. Harbour Board. Two electric capstans, electric portable crane, &c.*

Newcastle-on-Tyne.—May 22nd. Town Council. Remodelling of heating and electric generating plant, Barrasford Sanatorium. Particulars from Mr. E. Hatton, engineer and manager, Transport and Electricity Department, Manors, Newcastle-on-Tyne.

Plymouth.—June 5th. Electricity Department. One 1,500-kW converter. (May 8th.)

Sidmouth.—May 18th. Electricity Department. 1,000 yd. l.p. overhead line. (May 8th.)

South Shields.—May 22nd. Electricity Department. Two groups of Scott-connected transformers, each 1,250 kVA, also h.p. switchgear. (May 1st.)

South Africa.—CAPE TOWN.—May 22nd. South African Railways and Harbours. Two electric goods lifts.*

JOHANNESBURG.—May 30th. Municipal Council. Street lamp fittings and electric lamps.*

Spalding.—Urban District Council. Electricity generating plant, mains, transformers and meters. (See this issue.)

Turkey.—CONSTANTINOPLE.—Post and Telegraph Department. Parts and chemicals for Leclanché cells.*

Uruguay.—MONTEVIDEO.—June 10th. State Electricity Works. Six aerial transformer sub-stations.*

July 20th. Administracion del Puerto de Montevideo. Two electric cranes.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—MELBOURNE.—Commonwealth Department of Works and Railways.

Installation of three electric elevators, Sydney G.P.O. (£12,872).—Standard-Waygood, Ltd.

Metropolitan Tramways Board.

Automatic sub-station equipment (£11,669).—English Electric Co., Ltd.; (£19,585).—Australian General Electric Co. —*Tenders.*

Bath.—Downside Abbey, Stratton-on-the-Fosse. Accepted:

104-b.h.p. crude-oil engine (£1,000).—Peter Brotherhood, Ltd.
70-kW. d.c. generator (£371).—Greenwood & Batley, Ltd.
Switchboard extension (£59).—Park Royal Engineering Co., Ltd.

Budleigh Salterton.—Budleigh Salterton Electric Light and Power Co., Ltd.

Two 56/60-b.h.p. crude-oil engines (£1,200).—Vickers-Petters, Ltd.
Two 33-kW dynamo and motor boosters (£526).—Greenwood & Batley, Ltd.
Main battery of 120 cells, 600 amp.-hr. (£1,200).—Premier Accumulator Co., Ltd.

Blackpool.—Blackpool Pleasure Beach, Ltd.

5,400 "Osram" colour-sprayed lamps; 1,700 "Osram" frosted lamps.—General Electric Co., Ltd.

Birkenhead.—Electricity Committee. Accepted:—

500 yd. of cable (£183).—W. T. Henley's Telegraph Works Co., Ltd.

Bury.—The Town Council has placed the following contracts:—

Six electric tramcar vestibule bodies, with top deck covers; 6 top-deck covers (totally-enclosed type), with platform vestibules; 12 pairs maximum traction trucks; 24 trailers, fitted with special run-back.—English Electric Co., Ltd.
12 tramcar motors, &c.—General Electric Co., Ltd.

Canterbury.—Town Council. Accepted:—

1,000-kW motor converter (£3,765).—Bruce Peebles & Co., Ltd.

Chesterfield.—Electricity Committee. Accepted:—

Cable (£1,623).—Pirelli-General Cable Works, Ltd.
Switchgear (£122).—British Thomson-Houston Co., Ltd. (£122).—New Switchgear Construction Co., Ltd.

Derby.—Town Council. Accepted:—

Steam and water piping, pumps, de-gassing plant, &c. (£8,122).—Aiton and Co., Ltd.

Glasgow.—The recommendation of the Works and Stores Sub-Committee of the Corporation Tramways Committee to accept the offer of the United Steel Products Co., Ltd., for special trackwork at £3,788, the price being about £300 less than the lowest of the three British tenders, has been reversed by the Tramways Committee, which recommends that the lowest British offer at £4,100 should be accepted.

Ilfracombe.—Urban Council. Accepted:—

Wiring and fitting the pavilion and bandstand for electric light (£145).—E. J. H. Bluett. The other tender received was from the Ilfracombe Electric Light and Power Co. at £135.

India.—India Store Department.

Two Crompton 3½-kW, d.c. generators, complete with switchboards and regulators (Rs. 1,500); 21 Crompton 110-V, d.c. ceiling fans (Rs. 2,520). —*Indian Engineering.*

London.—ADMIRALTY. Accepted:—

21,000 special Robertson carbon-filament lamps.—General Electric Co., Ltd.

LONDON COUNTY COUNCIL.—The Council, at its meeting on May 5th, gave its approval to the purchase, which had been made by the Highways Committee, of 40,000 tons of coke from the South Metropolitan Gas Co., which is being used on the "sandwich" system at Greenwich power station.

Manchester.—Electricity Committee. Accepted:—

Cable.—British Insulated & Helsby Cables, Ltd.; Macintosh Cable Co., Ltd.; Callender's Cable & Construction Co., Ltd.
Dictaphones.—Dictaphone Co., Ltd.
Steam soot-blowing apparatus.—Babcock & Wilcox, Ltd.
Weldless steel spigot and faucet tubes.—Bromfords, Ltd.
D.c. watt-hour meters.—Aron Electricity Meter, Ltd.
3-phase static transformers.—Ferranti, Ltd.; Hackbridge Electric Construction Co., Ltd.
Wiring of lighting and heating circuits (High Street depôt).—G. Hill and Co., Ltd.
6,600-V sub-station switchgear.—General Electric Co., Ltd.; Ferguson, Pailin, Ltd.

Tramways Committee. Accepted:—

Car truck side frame steel castings.—English Electric Co., Ltd.

Education Committee. Accepted:—

Electric lighting installation (Alma Park School).—R. Seddon & Sons.

Mansfield.—Town Council. Accepted:—

Two 2,000-kW transformers and one regulating transformer and controller (£4,022).—British Electric Transformer Co., Ltd.
5-panel armour-clad e.h.p. switchgear, 11,000 volt., and 3,000 volt (£2,094).—Ferguson, Pailin, Ltd.
D.c. control panel for 1,000-kW motor converter (£304).—Bertram Thomas.

Oldham.—Electricity Committee. Accepted:—

1,000-kVA transformer.—Ferranti, Ltd.

Ramsgate.—Town Council. Accepted:—

14 fire-alarm boxes, &c. (£913).—Western Electric Co., Ltd.

Southport.—Gas Committee. Recommended:—

Engine (£399).—Browett, Lindley & Co., Ltd.
Generator (£210); switchboard (£62).—Electric Traction Co., Ltd.

Submarine Cable Contracts.—The Western Union Cable Co. has placed an contract for a new loaded cable across the Atlantic with the Telegraph Construction & Maintenance Co., Ltd., at a cost of about £1,100,000. Other submarine cable contracts were mentioned in our "Telegraph Notes" of May 1st, page 698.

Watford.—Electricity Committee. Recommended:—

Cable contract for 12 months.—W. T. Henley's Telegraph Works Co., Ltd.

Wimbledon.—Electricity Committee. Recommended:—

Switchgear equipment (£345).—A. Reyrolle, Ltd.
Electric winch for coal-handling purposes (£282).—Witton Kramer Electric Tool & Hoist Works, Ltd.
Oil-treating and testing plant (£175).—Empsons Centrifugals, Ltd.

York.—City Council. Accepted:—

Two 25,000-lb. water-tube boilers (£15,422).—John Thompson, Ltd.
Motor generator and cables (£2,419).—English Electric Co., Ltd.
Switchgear, Lendal Bridge sub-station (£934).—General Electric Co., Ltd.
Motor converter (£5,923); and l.p. switchgear (£625).—British Thomson-Houston Co., Ltd.
H.p. switchgear for motor converter (£630).—Metropolitan-Vickers Electrical Co., Ltd.

The Council rejected the recommendation of the Electricity Committee to accept a Belgian tender for a motor converter, which was stated to be £1,200 below the lowest British tender.

Councillor E. Lacey, in moving the amendment that the lowest British tender should be accepted, urged that the Council ought not to spend its money abroad where conditions of labour were such that Britain could not compete with them.

Councillor T. J. Kilyon thought that the greatest memorial the city could provide for the gallant dead would be to find work for the men who returned from the war. They had a duty to the British working man to give him work, and he contended that the difference in price did not warrant the Council's sending this contract outside the country in view of the large number of unemployed. The amendment was carried by 30 votes to 11.

Forthcoming Events.

Institute of Transport.—Friday and Saturday, May 15th and 16th. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 10 a.m. Continuation of annual Congress.

Royal Institution of Great Britain.—Tuesday, May 19th. At 21, Albemarle Street, W. At 5.15 p.m. Tyndall Lecture on "The Passage of Electricity through Vacuum Tubes," by Mr. R. Whiddington.

Illuminating Engineering Society.—Tuesday, May 19th. At the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, W.C. At 7 p.m. Paper on "A Survey of Lighting in 800 Retail Shops," by Messrs. W. J. Jones and H. Lingard.

Royal Society of Arts.—Wednesday, May 20th. At John Street, Adelphi, W.C. At 8 p.m. Lecture on "William Sturgeon and the Centenary of the Electro-Magnet," by Prof. J. A. Fleming, F.R.S.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

RED CROSS commutator compound.
Electrically-driven lawn mower.
Chain switch lamp holders (manufacturers only).

Notes.

A Standard System of Supply.—The following announcement, dated May 1st, is reprinted from the *London Gazette*:—For the purposes of the Electricity (Supply) Acts, 1882 to 1922, and the Orders made and issued thereunder, and all special Acts relating to the supply of electricity, the Electricity Commissioners approve of the system of supply described hereunder, subject to the regulations made by the Electricity Commissioners for securing the safety of the public and for ensuring a proper and sufficient supply of energy.

System of Supply.—A three-phase alternating-current supply at an extra-high-pressure of 6,600 volts (or 11,000 volts, or 33,000 volts, or 49,500 volts, or 66,000 volts, as the case may be).—(1) The supply will be given (*a*) for general supply at high pressure to transformers, converters, or motors on the consumers' premises, or at medium or low pressure; (*b*) for traction purposes at medium pressure. (2) The extra-high-pressure and high-pressure supplies will be given by alternating current, and the medium and low-pressure supplies will be given by alternating or direct current. (3) All alternating current will be at a frequency not varying from 50 complete cycles per second by more than 2½ per cent. plus or minus.

Mains.—The mains will consist of insulated conductors laid together and enclosed in a lead sheath, and either (*a*) braided, compounded and armoured, and laid direct in the ground, and covered with (i) wooden planks 2 in. thick, and (except for making up pieces and at bends) 10 ft. long, and treated with preservative compound to prevent decay; or (ii) reinforced concrete slabs, 3 ft. long by 2 in. thick, and 6 in. wide, and suitably interlocked so as to prevent lateral displacement; or (iii) concrete, made *in situ*, 3 in. thick, of a minimum width of 9 in. and overlapping the breadth of the mains by at least 2 in. on each side; or (*b*) drawn into pipes or ducts of approved design; or (*c*) laid in troughs filled in with composition and covered with hard burned tiles or other approved protection held in position through contact with the filling in composition.

Any joint electricity authority or authorised undertakers adopting an e.h.p. system in pursuance of this general approval must notify the Electricity Commissioners in order that the regulations for securing the safety of the public and for ensuring a proper supply may be prescribed where necessary. Any e.h.p. system other than that described above will require special approval by the Electricity Commissioners.

Colliery Locomotive Tests.—Tests took place at the Brodsworth Colliery, near Doncaster, last week of the models competing for Mr. Charles Markham's prize of £1,000 for an efficient type of electric storage-battery locomotive for use underground in pits. Five firms competed, *viz.*:—The Metropolitan-Vickers Electrical Co., Ltd.; Messrs. Patterson & Co. (Newcastle); Thomas Broadbent & Sons, Ltd.; Sir W. G. Armstrong, Whitworth & Co., Ltd.; and R. & W. Hawthorn, Leslie & Co., Ltd. The idea underlying the proposal is to eliminate the pit pony, and the competition was open to the manufacturers of locomotives of any country, but the machines which took part in the tests were all of British manufacture. Ten designs were submitted for the competition, but only five were selected. The judges were Messrs. J. A. B. Horsley (H.M. Electrical Inspector of Mines), Roger T. Smith (Institution of Electrical Engineers), Roslyn Holiday (Mining Association), and Sidney Bates (Institution of Mining Engineers). Mr. Herbert Smith, President of the Miners' Federation of Great Britain, was appointed to act with these gentlemen, but owing to illness was unable to attend. The tests were carried out under the supervision of the Mines Department of the Home Office, Mr. A. M. Clegg acting as secretary.

On May 4th the preliminary part of the scheme took place. The locomotives, specially designed to comply with underground working conditions, were examined in the colliery charging house, and several trial runs were carried out on the tracks which had been laid down. The batteries had all been subjected to a severe test in charging and discharging, so as to comply with the rules of Mr. Markham's offer.

Examination of the machines, both electrical and mechanical, also took place. None of the models had to be more than 3 ft. 6 in. in height; the engine must have good clearance for the track; provision must be made for overhanging when rounding a curve, and the engine must be gas-proof and, so far as possible, proof against dust. There must be no possibility of a stray spark escaping while the engine is in motion. Imitation travelling roads in a mine had been constructed, and the engines had to negotiate junctions just as if underground. The tracks were quite close to the pithead, and special provision was made for gradient tests.

On May 5th—the first day of the actual tests—the locomotives were judged for brake control, speed for marshalling and shunting, and their drip- and splash-proofness. On May 6th they were tested for draw-bar pull with the aid of a special dynamometer, made by Mr. G. W. Watson, of London, who operated it. On May 7th the judges examined deliberate derailment of locomotives, and their replacement on the rails.

The locomotives appeared to run very easily, the four pit trucks being filled with rubble to make a total weight of five tons.

Edinburgh Electrical Society.—At the business meeting of the Society on Friday last, the following gentlemen were appointed for the session 1925-1926:—Messrs. J. G. Burchell, president; A. S. Black, vice-president; J. Foggo, W. Sharpe, G. Peirs, F. Campbell, committee; hon. secretary and treasurer, W. S. Johnson.

Electrical Development at Walthamstow. — In the note upon the recent electrical exhibition at Walthamstow which appeared in our last issue no reference was made to the display of Associated Fire Alarms, Ltd. This company showed a complete working equipment of both the building end of an automatic fire alarm installation and also the receiving apparatus in the fire station. In addition the company exhibited a 40-section indicating and signalling board; examples of "Pearson" railway signal repeater contacts; manual alarm pushes; large fire bells and fire extinguishers.

An Ediswan Valve Record.—The Edison Swan Electric Co., Ltd., has recently received back from one of its customers an A.R. valve which, although this type is only intended for use as a receiving valve, has been in constant use as a transmitting valve with 500 volts on the plate, and frequently up to as much as 7 volts on the filament. Under these conditions, we are informed, it gave better results than could be obtained with a 15- or 30-watt transmitting valve. At a very conservative estimate the valve had a life of not less than 350 hours. It did not burn out then, but was accidentally dropped, much to the regret of its owner. The valve was not specially selected, but was bought out of stock over the counter in the usual way, and its owner, resident in the Birmingham area, states that it was used regularly on two-way telephony with Aberdeen.

National Association of Supervising Electricians.—HIGHFIELD SHIELD COMPETITION.—The third annual competition for the W. E. Highfield Shield will be held at the Junior Institution of Engineers on June 9th, at 7 p.m., and papers must be received at the head office not later than Tuesday, June 2nd. There are four prizes: First prize (value about £4) given by the British Thomson-Houston Co., Ltd. Second prize (value about £3 3s.), given by the Sun Electrical Co., Ltd. Third prize (value about £2 15s.), given by Siemens Bros. and Co., Ltd.; and a special Associate's prize (£1 1s.), given by the members of the Board of Control. The winner of the first prize will be entitled to hold the W. E. Highfield Shield for one year. The object of the scheme is to encourage papers of a practical nature and original thought.

(*Continued on page 783.*)

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An Electrically-Driven Colliery Winding Plant.

The Fife Coal Co.'s Mary Pit.

THE present state of the British coal mining industry may be described as bordering on the deplorable. Within little more than the first three months of 1925 no fewer than 120 pits in Wales, Scotland, and the Durham and Northumberland fields were closed; unemployed miners probably number 160,000, and 400 pits have been rendered unproductive by reason of the unremunerative cost of operation. As the condition of industry generally improves, the home coal trade will, no doubt, grow better, but the fact remains that the cause of the present failure of the coal exporting trade is the severe competition in neutral markets consequent upon the output of coal in Europe having very largely increased as a result of low working costs.

Fig. 1.—Typical 3,000-volt Transmission Line.

It is therefore apparent that the reduction of the running expenditure is an essential factor, and in this connection the value of electricity as a labour saver and efficiency improver needs no emphasis. One of the most interesting examples of successful colliery electrification in this country is afforded by the Fife Coal Co., which has just completed the installation of electric winding equipment at 14 of its pits, and a noteworthy feature of this Scottish scheme is the fact that it has been carried out on a standard 3-phase 3,000-volt system with Allen West controllers, Reyrolle switchgear, &c.

The motors for all the winders, except those at the Lumphinnans XI and Mary pits, were supplied by Messrs. Bruce Peebles & Co., Ltd.

The company generates its own electricity for all colliery purposes at a central station at Kelty (which will be described in a subsequent issue), whence it is transmitted by means of overhead lines carried on wood poles (a typical example being illustrated in fig. 1) to the various pits as indicated in fig. 3. The total length of transmission lines is 17 miles; 12 miles of line operates at 3,000 volts and five at 6,600 volts, the latter being the pressure at which all future extensions are to be carried out.

Electricity is employed by the Fife Coal Co. for all purposes, both below and above ground; at a number of pits steam power is still made use of, but already 14 winding engines have been electrified as follows:—

Lumphinnans XI: 750 h.p.
Lumphinnans XII: 250 h.p.
Foulford No. 1: 250 h.p., and No. 2: 150 h.p.
No. 9 pit: 150 h.p.
Lassodie Mill: 150 h.p.
Blairadam: 150 h.p.
Lindsay pit: 400 h.p.
No. 7 pit: 250 h.p.
Mossbeath No. 1: 225 h.p., and No. 2: 400 h.p.
Aitken No. 2: 550 h.p.
Donibristle: (i) James, 400 h.p.; (ii) Marion, 250 h.p.; (iii) No. 12, 150 h.p.
Mary pit: 950 h.p. (1,400 h.p. peak load).

The last named is a new pit which has been provided with reinforced concrete head gear as shown in fig. 2; the winding plant and control gear are illustrated in figs. 5 to 8. Coal production commenced early in 1925, the sinking of the concrete-lined shaft, which is 1,800 ft. in depth, having been completed about the middle of 1923, for which operation a temporary winder was connected through double reduction gearing to temporary mechanical equipment. The permanent winding equipment described below was put into commission in July, 1923, and has been in successful operation since that date.

The electrical parts of the equipment were built by the British Thomson-Houston Co., Ltd., the mechanical parts having been supplied by Messrs. Fullerton, Hodgart and Barclay. The winder is designed for 40 winds per hour and an output of 216 tons of coal per hour from a depth of 1,800 ft. at a maximum rope speed of 34 ft. per second, the coal load per trip being 5 tons 8 cwt.

Fig. 2.—Reinforced Concrete Headgear, Mary Pit.

Two triple-deck cages are used, there being three hutches per deck, making a total of nine hutches per cage; simultaneous decking is employed. The drum is of the cylindro-conical type, 12 ft. to 18 ft. in diameter, and there are six live turns on the small diameter, 12 on the cone, and 18 on the large diameter. Since the total number of turns on the small diameter and on the cone is equal to the number of turns on the large diameter, the up-coming rope reaches the top of the cone at the same instant that the down-going rope begins to descend the cone on the other side of the drum, which feature accounts for the somewhat unusual shape of the winding diagram reproduced in fig. 4. The rope is $2\frac{1}{8}$ in. in diameter, Lang's lay, lock coil pattern.

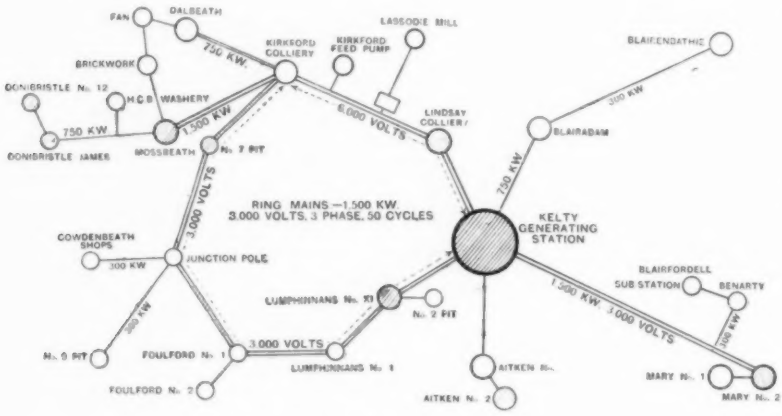


Fig. 3.—Transmission Line Diagram.

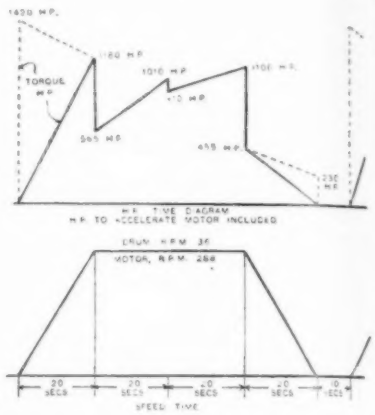


Fig. 4.—Winding Diagrams.

The drum shaft of the winder is driven through single-reduction, double-helical, machine-cut gearing by a slip-ring induction motor, figs. 5 and 6, having a full-load speed of 285 r.p.m. when supplied with power at 2,750/3,000 volts, three-phase, 50 cycles. This motor has a continuous rating of 950 h.p., and is capable of taking a peak load of 1,900 h.p.

The B.T.-H. control gear, fig. 8, comprises a main oil circuit breaker in a truck-type cubicle, high-pressure air-break stator-reversing contactors, the maximum capacity of which is 500 A at 3,300 V, and an Allen West liquid controller for the rotor circuit of the winder motor. It is of the LA 4A type, the maximum normal rotor voltage being 1,250 V and the maximum rotor current 1,500 A; it is capable of dissipating 4,500 h.p.-minutes per $\frac{1}{4}$ hour. The winder brake is operated by the driver through the medium of a compressed-air engine, the compressed air being drawn from the mine ventilation air supply. As a stand-by there is provided a small air compressor driven by a 10-h.p., 500-volt, 50-cycle, 710-r.p.m., slip-ring motor controlled by a switch-fuse and starter, and fed from a small auxiliary step-down transformer connected to the high-pressure supply through an ironclad mining type draw-out switch. This auxiliary transformer also provides the low-pressure supply for operating the brake magnet, which is capable of exerting a pull of 110 lb. through a distance of 2 in., and the h.p. stator reversing contactors, which are housed in a separate chamber in the basement. The door of this chamber is interlocked with the main oil circuit breaker so as to prevent access to the equipment until it has been rendered "dead."

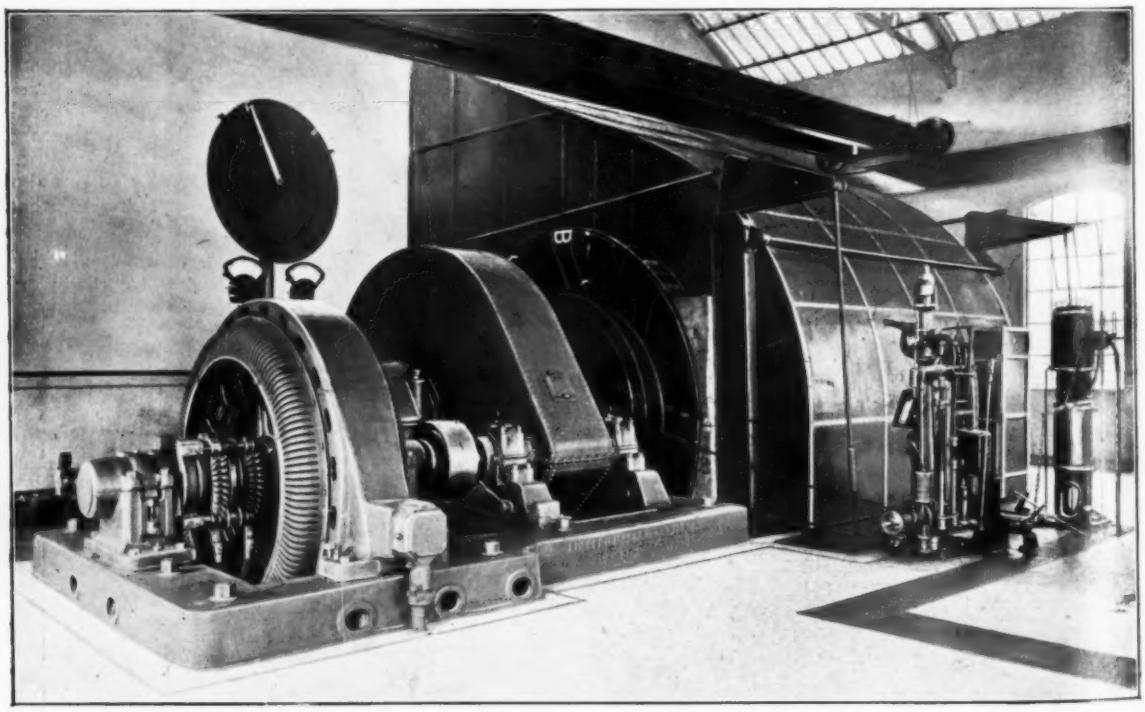


Fig. 5.—General View of the Mary Pit Winding Engine.

A Whitmore overwinding and overspeed device is incorporated, an interlocking switch being connected to the trip shaft of this device to ensure that when it

comes into operation for any reason, power will be cut off the winder, and the brakes applied through the medium of the brake magnet. The interlocking switch

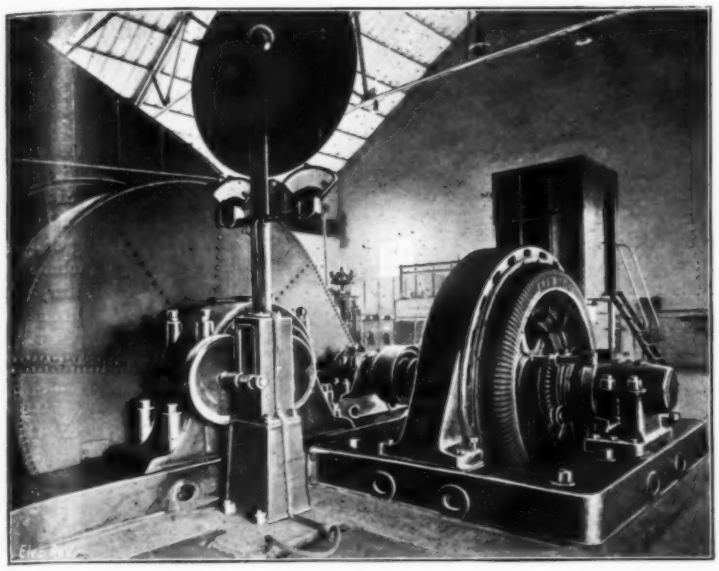


Fig. 6.—Winding Motor and Gear Case.

interrupts the no-volt coil circuit of the main switch. Illuminated-dial, sector-type, instruments are provided (one on each side of the depth indicator) as shown in fig. 5, to register the voltage at the motor terminals and the line current. Above these instruments are indicating lamps, a green lamp to indicate when the main switch is closed, and a red lamp which will light should the driver attempt to start to wind in the wrong direction.

The switchboard shown on the left in fig. 8 is composed of five panels, one for the incoming e.h.p. Kelty main (shown in fig. 1), one for the Mary Pit winder, one for the New Pit surface supply, one for the Mary Pit interconnector, and the last serves the underground workings of the New Pit.

The Fife Coal Co. and its engineer are to be congratulated, not only upon their electrification policy and the manner in which the conversion is being carried out, but also upon the results that are being obtained as a consequence. The use of electricity, by improving the efficiency of all colliery operations, enables a given number of employés to produce a greater output of coal, thus reducing the cost per ton of coal-getting. It is to be hoped that the Markham competition which is now in progress will lead to still more extended use of electricity in mines. If a really suitable electric locomotive could be evolved for underground haulage, it would supplant the pit pony, at any rate in new workings which could be so designed as to admit of the employment of suitably sized electric locomotives. In the United States, where such provision has been made, the pit pony is practically non-existent, whereas the roads in British mines are narrow and the roofs low.

The development of the electric winder has been of extreme interest. Reliability was the chief concern of colliery engineers anxious to make the experiment and the most common excuse for attacks by the sceptical. The success of plant operating under severe conditions changed the battle to one for economical supremacy over steam winders, and the subject is often further confused by the conflicting statements of those who attempt to compare conditions that are not truly comparable.

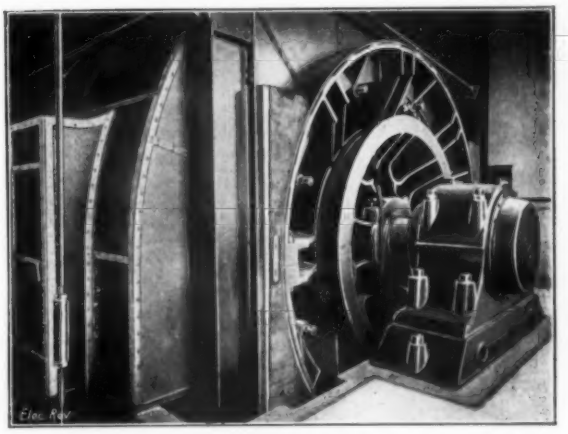


Fig. 7.—Bearing End of Winding Drum.

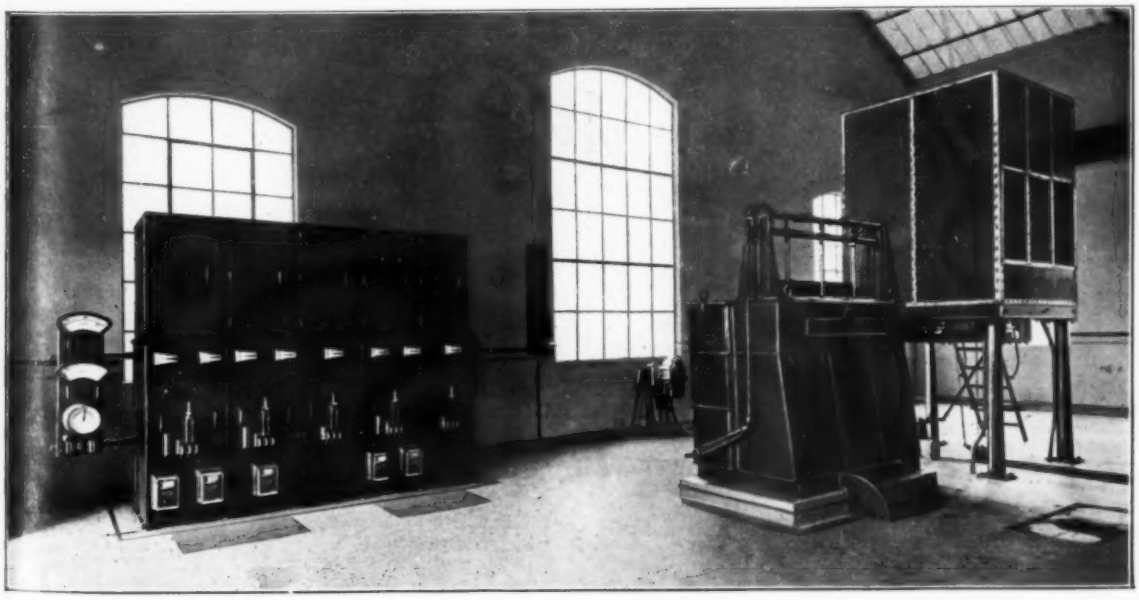


Fig. 8.—Switchboard, Liquid Regulator and Driver's Cabin.

In conclusion, we have to express our indebtedness to Mr. J. R. Copping, chief engineer to the Fife Coal Co., for his assistance on the occasion of our visit.

Weston-super-Mare's New Telephone Exchange.

A Manually-operated Installation.

ALTHOUGH the population of Weston-super-Mare, the popular Somerset watering-place, was 31,643 at the 1921 census, the telephone density is not sufficient to warrant the town's inclusion at present in the list of areas to be converted to Strowger automatic operation. Nevertheless, local requirements necessitated expansion, and consequently a new central-battery manual switchboard was recently placed in service.

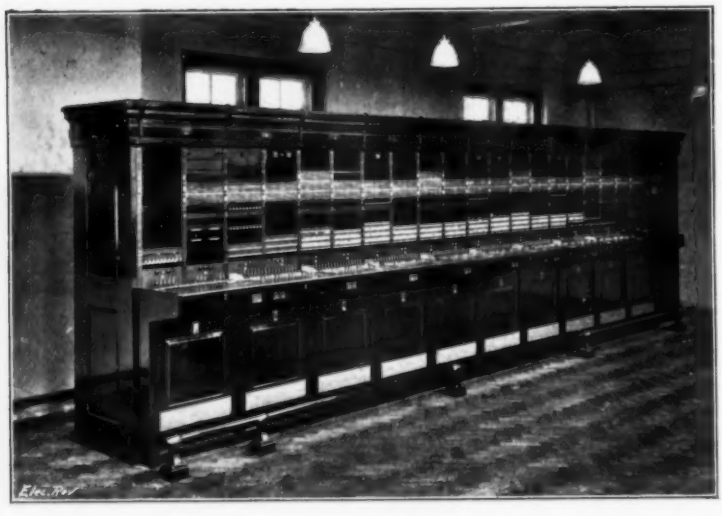


Fig. 1.—New Manual Switchboard.

The equipment, of the No. 10 type, was manufactured and installed for the Post Office by the Automatic Telephone Manufacturing Co., Ltd., and has a present capacity of 800 subscribers' lines, with accommodation for an ultimate growth to 1,880 subscribers' lines. The switchboard (fig. 1) is a subscribers' multiple "A" and

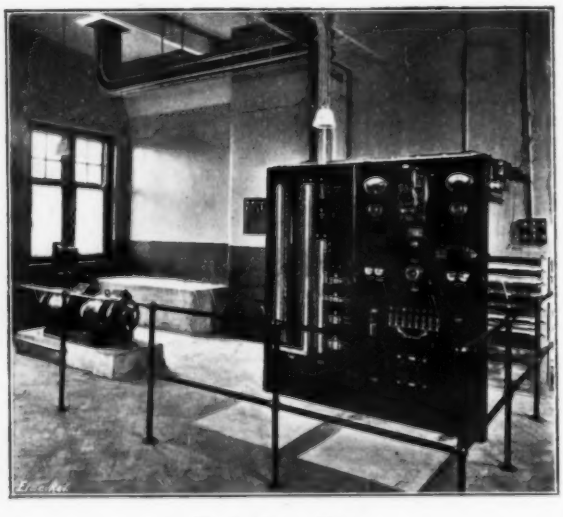


Fig. 2.—Power Plant.

"B" board with 4-panel multiple. The order and number of sections, viewed from the front of the switchboard, from right to left, are: One cable-turning section with meter panel; one 2-panel section unequipped; two 2-panel sections equipped with jack-ended junctions; six 2-panel subscribers' sections; and one 2-panel supervisory position and plugging-up lines.

The two outgoing junction positions are each equipped with 17 cord circuits, whilst the six subscribers' positions are equipped with 16 cord circuits. Dialling-in equipment fitted to the keyshelf at each operator's position facilitates the direct dialling of subscribers associated with near-by automatic exchanges, *e.g.*, those at Newport, Hereford, and Gloucester, the conversion of the last-named to Strowger automatic operation being already in progress.

Other auxiliary equipment of the new exchange (fig. 3) includes m.d.f., i.d.f., relay and meter racks, special apparatus rack, repeating coil and condenser rack, fuse board, a one-position test desk, and a two-position supervisor's and monitor's desk. The switchroom is on the second floor of the head post office.

The power plant (fig. 2) comprises a 65-A, 28-V charging set, consisting of a protected shunt-wound motor operating at 460 volts d.c., coupled direct to a shunt-wound dynamo, with regulation between 24 and 32 volts, the speed being 1,000 r.p.m. The two-panel enamelled slate power board carries battery fuses for the manual circuits, various switches and meters, and the ringing machines (with control switches and fuses) in duplicate, designed to work off the exchange main battery,

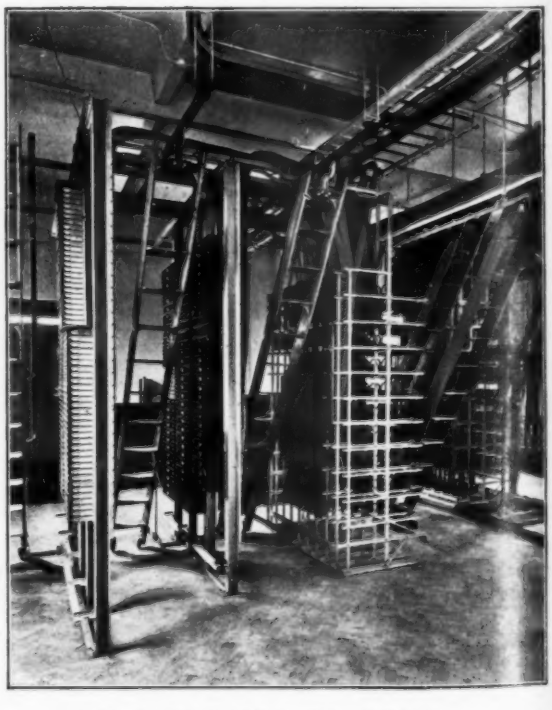


Fig. 3.—Meter and Relay Racks, M.D.F., &c.

which comprises two sets of 12 l.p., type 11 Tudor elements in lead-lined boxes.

Each battery has a present capacity of 282 ampere-hours when discharged at the nine-hour rate, and the boxes are large enough to accommodate extra plates to raise the capacity to 452 ampere-hours when extensions of the system require it.

Notes.

(Concluded from page 778.)

The Shannon Power Scheme.—The Irish Free State Lower House of Parliament last week (May 8th) passed, after lengthy debate, the second reading of the Shannon Electricity Bill, an amendment by the Farmers' Party for postponement pending inquiry by a Parliamentary Joint Committee into the financial, engineering, and economic proposals of the scheme being rejected by 44 votes to 17.

Mr. McGilligan, Minister for Industry and Commerce, stated that if the Bill passed before the Lower House rose for the Summer Recess on June 28th, the first German boatload of material to start the constructive work on the Shannon would be landed at Limerick some time in July, and he hoped President Cosgrave would be able to cut the first sod about September. Prof. Rushworth, of Galway University, who had been appointed chief engineer, and Mr. P. H. McCarthy, a well-known Dublin engineer, who had been appointed to act in an advisory capacity, had assured him that they had examined the scheme, and that there was nothing to prevent its being brought to a head with the exercise of ordinary engineering skill. Commercial inertia and lack of employment made it advisable to start the work as soon as possible.

Replying to criticisms during the debate, Mr. McGilligan said the consumption of electricity in the Free State last year was 45 million units. Very little was used for heating purposes owing to the cost. Under the scheme they would have 110 million units to sell, of which 20 millions would be sold for heating purposes at .35d. If they did not sell those units for heating they would drop £30,000 in their estimated return, but, notwithstanding that, if they charged double price for the rest they would even then be able to get a return. They could double the price in Dublin, Cork, and Limerick, and all through the country, and still cut the price people were paying for electricity at present without selling an additional unit to the amount now being sold. The scheme at this moment was successful, minus the £30,000 for heating.

The Committee stage of the Bill is fixed for to-day.

With regard to a complaint by Mr. McGilligan that no popular enthusiasm is being shown in the Free State for the Shannon scheme, the *Irish Independent* observes: "The reason is not far to seek. The doubts and misgivings felt by the people are responsible; and the unusual procedure adopted by the Ministry and the haste with which this Bill is being forced towards the Statute Book, have given rise to these doubts and misgivings."

Urging that further examination of the scheme is essential, the *Irish Times* writes that "enthusiasm does not always command success. The dangers of failure cannot, and must not, be overlooked. With a little care now costly blunders might be avoided and the nation might be spared a bitter disappointment."

Educational.—THE POLYTECHNIC, REGENT STREET, W., ELECTRICAL ENGINEERING DEPARTMENT.—A special course of lectures on "The Theory of the Alternating Current Circuit" will be delivered at the Institution by Mr. H. P. Young on Thursdays, commencing May 21st, from 6.30 to 8.30 p.m. (See our advertisement pages to-day.)

"Super-Power" in the United States.—The extent of the growth of the "super-power" systems of the United States is admirably shown by the statistics relating to the electricity supply industry collected under an official census covering the year 1922. These statistics, which are reproduced in the *Electrical World*, show that one-third of the energy produced in the United States is generated by eleven systems. Although in 1922 6,355 systems were in operation, 106 of them produced 80 per cent. of the electricity consumed. The figures are accompanied by a map of the United States shaded to show the density of electrical development. The State of New York had the highest output in 1922, this being over 500 million kWh. Pennsylvania and California each produced over 400 million kWh, while the third place was occupied by Illinois with a production of over 300 million kWh. Only ten States, including the small States of Delaware and New Hampshire, had outputs below 100 million kWh.

Appointments Vacant.—Telephone maintenance inspectors for the Shanghai Mutual Telephone Co., Ltd. Temporary substation attendant for the Stepney Borough Council electricity works. Mains superintendent (£368) for the Tunbridge Wells Corporation electricity works. Shift engineers for the Public Works Department of the Nigerian Government. (See our advertisement pages to-day.)

Electricity at Agricultural Show.—As stated in our issue of February 20th (p. 283), the Chester Electricity Committee is giving a free supply of electricity to exhibitors at the Royal Agricultural Show which is to be held at Chester in July next. The city electrical engineer, Mr. S. E. Britton, M.I.E.E., has circularised the exhibitors, conveying particulars of the Committee's scheme and offer, and the results are gratifying. Considerable demands for power, heating and lighting have been received, including over 100 h.p. for power, the motors ranging from 1 to 15 h.p. Heating is required chiefly for water boilers and urns, &c. Lighting is required for general purposes and in a few cases for electric signs.

Underground Cable for e.h.p. Overhead Transmission.—According to the *Electrical World*, standard lead-covered underground three-core paper-insulated cable is being used by the Public Service Company of Northern Illinois as aerial cable for transmitting at a pressure of 33,000 V. It is being done to avoid the objections to underground cable and also open-wire construction. The cable is suspended from a messenger wire, and weighs 11 lb. per ft. The installation, which is about 3,000 ft. long, will be watched carefully to see how it stands the heat of summer and cold of winter, as well as mechanical damage. The cable terminates in trifurcating boxes by which it is connected to an ordinary 3-way overhead line.

The Mersey Tunnel Scheme.—The question of the promotion of legislation providing for the construction of a new tunnel under the Mersey, at a cost of £5,000,000, was recently submitted to the vote of the Liverpool ratepayers. The result was a large majority in favour of the scheme, although the percentage which voted was small.

Collieries Electrification.—An electrification scheme of the main underground haulage plant at the Wearmouth and Hylton, Sunderland, collieries was recently completed. A 3-phase, 20,000-V, 40-cycle supply is received at the Hylton colliery from the County of Durham Electric Power Supply Co., Ltd., and its pressure is reduced to 2,200 V by an 800-kVA transformer. In the case of the Wearmouth Colliery the supply is received from Sunderland Corporation electricity undertaking at 5,000 V and is transformed down to 2,750 V; the supply is 3-phase, 50 cycles. It is interesting to note that the working pressures in the two collieries vary in direct proportion to the frequencies, thereby rendering the motors interchangeable on the two supplies, the relative capacities of the motors being 200 h.p. on the Hylton pressure and 250 h.p. on the Wearmouth pressure.

Gold from Mercury.—Some information is given in *Science* relating to experiments resulting in the production of gold from mercury, recently carried out by Prof. Nagaoka, of the Institute of Physical and Chemical Research, Tokio. A pressure of millions of volts was employed, which, by a special device, was concentrated upon a narrow space in the immediate neighbourhood of the surface of the mercury. On evaporating the mercury, gold was deposited on the bottom of the vacuum distilling apparatus in a very thin film. The experiment was carried out in an extremely intense electric field. In order to be sure of transmutation, repeated purification of the mercury by distilling in a vacuum at temperatures below 200 deg. was essential. The experiment is to be repeated a few times in order to obtain the best laboratory arrangement, when the method will be made public. The object of the researches is not the production of gold in commercial quantities but the study of the internal structure of atoms. From an investigation of the fine structure of the lines of the mercury spectrum, Prof. Nagaoka came to the conclusion that the nucleus of the mercury atom consisted of a compact central mass with a proton particle elastically connected with it, and that if this proton could be detached from the mercury atom by some sufficiently powerful force the remaining nucleus would have the same positive charge as that of gold and a similar arrangement of electrons.

Rubber Gates for Water Turbine Control.—A novel idea of controlling the flow of water to the turbines by means of steel and rubber flexible gates has resulted in the construction and use of such gates at the new hydro-electric station at the Glen Falls, N.J., U.S.A., of the Moreau Manufacturing Co. The rubber element of the gates supplies the necessary flexibility and acts as a water seal, while the steel members hold the gates in shape and enable them to withstand the water pressure when they are closed.

The rubber diaphragm for each gate is made in two sections, each 5 ft. 9 in. by 17 ft. 2 in., made up similar to a conveyor belt, and consists of eight plies of heavy rubber-frictioned belting duck vulcanised together, the whole protected by a high-grade rubber cover 1/16 in. thick extending round both sides and edges. Two sections are placed edge to edge, giving a total overall width of 11ft. 6 in. Over the longitudinal joint is placed a rubber strip 4½ in. by 1/16 in. thick. The sections are punched to template and all cut edges, where the duck is exposed, are given cement treatment. To the outside face of each beam there is riveted a 10 ft. 2 in. by 4½ in. 4-ply rubber-covered belt in such a position as to overlap the adjacent beam and prevent the entrance of any material likely to interfere with the regular operation of the turbines.

To the end H beams of each gate two triangular rings are riveted as attachments for the suspension and operating chains. The suspension chains lead from the attachments on the upper H beam to a steel framing placed 8 ft. above the power-house floor, while the operating chains fastened to the lower attachments lead over head sheaves to ensure alignment and then over 15-ton double chain blocks, which are engaged by the power-house crane when operating the gates. In the loop of the gate is suspended a floating hollow concrete roller 11 ft. 4 in. long and 30 in. outside diameter.

A thorough trial of the gates, which have been patented and are known as the White-Hutchins, has demonstrated the soundness of the design. The diaphragms and other rubber parts used in the construction were all designed and manufactured especially for the purpose by the Manhattan Rubber Manufacturing Co., of Passaic, N.J., U.S.A.

Platinum Discovery in the Transvaal.—It is reported that a platinum reef of great width has been discovered in the northern portion of the Lydenburg fields near the Olifants River, North-Eastern Transvaal. The reef has been traced for nine or ten miles and in one place, where fully exposed, it is 70 ft. wide. The surface values are two to three pennyweights per ton.

The Leafield Coupled Arc.—The Poulsen arc, if directly connected to an antenna, produces a great deal of disturbance to other wireless users on wave-lengths far removed from that of the arc. This disturbance is of two kinds, (1) the emission of harmonics, *i.e.*, emissions which are definitely tunable and which can be heterodyned to a musical note, and (2) what has been called "mush." The latter manifests itself as a hissing sound and is usually found most strongly in the neighbourhood of the harmonic positions. The cause of harmonics is the slight departure from sinusoidal form of the current in the oscillating circuit. Suitable design of the arc and the aerial circuit may reduce the strength of the harmonics below what is normally obtained from a valve oscillator of similar power on a plain aerial, but in practice the harmonics, and more especially the "mush" are still strong enough to give trouble.

The cause of "mush" is probably associated with the irregular frequency of the fundamental wave. The arc is an ionic contrivance and on a plain aerial connection has a frequency which, in view of the ionic action inside the arc chamber, cannot be expected to be very constant. Carson has shown that if a sine wave has its frequency changed at a sinusoidal rate (in other words, undergoes frequency modulation) an infinite series of harmonics of the sum and difference of the fundamental and modulating frequencies is obtained. When any one harmonic of this series happens to fit in with an harmonic resonant point of the antenna system, it gives rise to radiation on that frequency. With the arc, the fundamental frequency is undergoing frequent discontinuous changes and the "harmonics" due to these irregular changes form a continuous spectrum of disturbance, which is ready to emerge at any harmonic resonant point of the antenna.

The theory outlined above indicates that the provision of a primary oscillating circuit for the arc, in which both the capacity and inductance were concentrated, would tend to prevent the harmonic e.m.f.'s giving rise to currents of sufficient order to cause disturbance. The antenna system, with its distributed capacity and inductance, of necessity has harmonic resonance positions, so that the introduction of the primary circuit should cut down the harmonics before they get into the antenna system. The coupled circuits used in the early days of the Poulsen arc were discontinued, apparently, on account of trouble with variable frequency. Small-scale experiments with the 25-kW arc at Stonehaven in March, 1922, indicated that successful working of the coupled-circuit arc was possible and that the reduction of mush and harmonics was very considerable. Attention was next paid to the 30-kW arc at Northolt which was installed in July, 1922, and the coupled circuit here proved equally successful.

A coupled circuit for the arc at Leafield was brought into commercial use in March, 1924; it involved radical changes in the layout of the plant and, as the station was in almost continuous commercial use, the operation of installation was necessarily a lengthy one.

In a paper read before the Wireless Section of the Institution of Electrical Engineers, Major A. G. Lee, B.Sc., M.I.E.E., and A. J. Gill, B.Sc., M.I.E.E., described details of the design of the various portions of the circuit and explained its tuning properties. The coupled circuit is found to give very constant frequency, and the factors contributing to this were dealt with in detail. The reduction of harmonics and mush thus achieved is very large, but the steps taken to reduce the residuum to still smaller proportions were described.

Boiler Explosion Reports.—We have received a copy of the report of the official preliminary inquiry into the circumstances attending the failure of the superheater of a water-tube boiler at the Borough Electricity Works, Weymouth, on December 11th, 1924. The superheater was of the Babcock and Wilcox usual type. Two vertical tubes were drawn completely out of the lower manifold of the superheater, until their ends were about ¼ in. clear of the holes in which they had been secured, and through these openings the contents of the boiler escaped.

The opinion is expressed in the report that the explosion was caused by repeated shocks and vibration due to "water hammer" in the steam pipe connected to the steam collector of the superheater. The daily recurrence of this action had gradually reduced the holding power of the tubes in the lower manifold, and started the partial withdrawal of the tubes from the holes into which they had been expanded, the withdrawal being made possible by the uptake tubes being only expanded and not bell mouthed. The drainage arrangement of the steam pipe system was not satisfactory, resulting in the water hammer action.

No means of draining the pipe line were provided at one end of the main range, which was closed by a blank flange, other than by opening the stop valve to the refuse destructor blowers, and no special arrangements were made for anchoring the pipe.

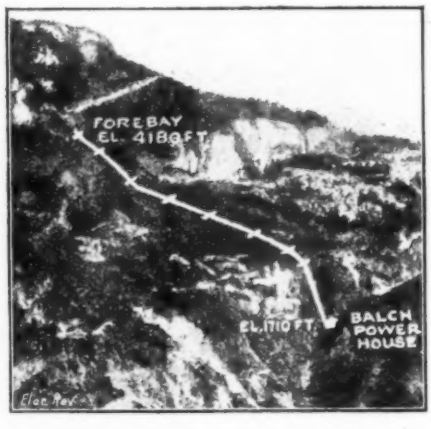
A similar report of an inquiry into an explosion from a vulcanising pan at the works of the Standard Insulator Company, Kilburn, in which the pan cover was completely detached from the pan and projected upwards till it struck the ceiling, attributes the explosion to the weak design of the pan cover.

The cover was light in construction and secured by bolts which, being fitted in slots and not in holes, were incapable of giving radial support which would have helped to resist the deformation that occurred. This type of cover is no longer made.

The official report on an explosion which occurred at Lots Road on November 27th, 1924, was recently issued. The boiler was of the water-tube land type as constructed by Messrs. Babcock & Wilcox. The clamp holding the fourth header cap, in the second row of tubes at the back end, fractured in way of the bolt head, allowing the cap to be forced off and the contents of the boiler to escape. A flaw of long standing had existed in this clamp, and the crack extended until the section of material left was unable to withstand the stress to which it was subjected. The material at the fracture was not sound and had been overstressed. This was a contributory cause of the ultimate failure of the clamp to which the explosion was due.

An Electricity Board's Orchestra.—The Ayrshire Electricity Board orchestra, under the leadership of Mr. Walter E. Upton, recently gave a successful concert in Ayr County Hospital. The orchestra has only been in existence since February, and Mr. Upton was congratulated on his good work in training the members. Mr. Bexon, general manager of the Electricity Board, acknowledged a vote of thanks awarded the orchestra.

Hydro-Electric Plant with a 2,400-ft. Head. — The *Electrical World* describes a new hydro-electric plant to be built soon by the San Joaquin Light & Power Corporation, Fresno, Cal., on the Balch plant of its Kings River hydro-electric development. The initial installation will consist of a stream-flow plant containing a 28,250-kW generator driven by double-overhung impulse water-wheels. The effective head will be 2,400 ft., giving this plant a higher head than any other installation in North America.



Location of Penstock on the Proposed San Joaquin Installation.

A simple concrete dam will divert the water through an unlined tunnel 19,600 ft. long, 12 ft. deep, and 12 ft. wide. A single penstock, branching at the lower end for the two wheels, will convey the water from a surge chamber to the plant. The penstock will be 4,725 ft. in length, 58 in. in diameter at the top, and 26 in. at the bottom. It will be of welded steel 1⅛ in. thick at the lower end, tapering down to ⅜ in. at the top. Up to a thickness of ¾ in. riveted steel will be used. Transmission will be at 110 kV for a distance of 39 miles to the Sanger sub-station, near Fresno. Twenty-two miles of this line is already completed. The accompanying diagram illustrates the location of the power house and penstock.

Hydro-Electric Power in Sweden.—Among the papers presented at the recent Stockholm congress of the Swedish Water Power Association was one by Mr. C. Kloman dealing with the power situation. The author stated that the improvement in the industrial life of the country in 1924 was also expressed in a constantly growing production of power and an improved remunerativeness. In 1923 the production of power amounted to 2,900,000,000 kWh, and it increased to about 3,200,000,000 kWh in 1924, or by about 10 per cent., the increase applying for the greater part to the output of the older but not fully loaded works. If the situation from the standpoint of the production of power was relatively satisfactory, it could not be said that there was any specially active interest at present being shown for more comprehensive enterprise in power undertakings, the works put in hand in recent years being chiefly smaller installations of a few thousand horse power at the most. At the present time private works of a combined total of 40,000 kW were in course of construction, together with State works of about the same capacity (Lilla Edet and the Norrforsen). At the end of 1924 the modern power stations, both private and State property, represented 1,020,000 turbine kW, this figure showing an increase of about 20,000 kW during the year.

The St. Lawrence River Project.—After negotiations lasting over a year, the way has been cleared for the active undertaking of the engineering survey of the St. Lawrence River deep waterway project by a final agreement between the United States and Canadian Governments on instructions to govern the joint engineering board's study of the problem. The final draft of instructions to the board, made public simultaneously in Washington and Ottawa, with the complete correspondence in the negotiations, showed that a compromise was finally reached in the matter of water diversions to be considered in studying the power possibilities of the project. By this the joint board is directed to consider in its study the effect on natural water levels in the St. Lawrence River of water diversions from the Great Lakes or the river made under licence of either government. Belief that, with the final agreement on instructions, the engineering study of the joint board could be completed within a year, was expressed in a statement issued by Mr. Hoover, as chairman of the American St. Lawrence commission. The settlement, he said, marked a decided step in progress toward determination of the facts and therefore the solution of the problem.—*Reuter's Trade Service* (Washington).

The Humber Tunnel Project.—The Minister of Transport, in a letter addressed to Commander Kenworthy, a copy of which was placed before the Hull Chamber of Commerce recently, advised the formation of a strong local committee representing all interests, to further the scheme for a Humber tunnel. A tangible project could then be drafted and submitted to the department for consideration with the full weight of local administrative bodies behind it.—*The Times.*

An Electrical "Safety First" Device.—As a precaution against accidents in the Hammersmith Road, a busy thoroughfare, the engineering staff of Messrs. J. Lyons & Co., Ltd., have designed a device which warns vehicles of the egress of lorries and vans from the company's Cadby Hall premises. A model of the familiar Lyons motor van is arranged to run on rails above the exit, and it projects well over the pathway. Vans leaving the depôt pass over a strip in the roadway under the arch and set mechanism in motion which puts a small electric motor on the model into operation, and this propels the model forward upon the rails. Before it finally leaves the archway the van causes a reversal of the operation and the model van is thereby returned. At the same time, by means of studs set at intervals in the roadway an electric horn is operated giving an audible warning to passing traffic.

Portable Emergency Sub-stations.—Some particulars are given in the *Electrical World* of three portable sub-stations which the Southern Power Company has in service. These sub-stations, which are mounted on railroad cars, are suitable for operation on primary pressures up to 100,000 V. Each sub-station is carried by two cars, one loaded with three single-phase, 1,000 kVA transformers, and the other with the switching and metering equipment, provision being made for transformers of any other rating on the second car.

One of these sub-stations is kept at each extreme of the company's system and one in the region of the greatest load, and they have proved invaluable in "servicing" customers in time of trouble as well as supplying temporary power during construction. The switchgear and meter equipment consists of 3-pole, electrically operated, 100,000-V air break switches, a blower driven by a 20-h.p., 110-V motor for cooling the transformers, a switchboard complete with ammeters, voltmeters, indicating and recording wattmeters, and a 3,000-A, 7,500-V, 3-pole oil switch on the secondary side.

A feature of these sub-stations is the speed with which they can be put in service. By means of a ratchet device the h.p. transformer insulators, together with their support, are lowered into tanks positioned directly under them, for clearance in transportation.

Automobile Ignition Failures. — Contrasting the figures lately issued by the Mechanical First-Aid Department of the Motor Club of Chicago, with those recently made public in connection with the R.A.C. "Get-you-Home" service in this country, it would appear that ignition trouble is much more prevalent in the United States than in this country, for whilst in England only 18.4 per cent. of the total of 5,039 breakdowns dealt with were due to ignition, the American proportion was 10,695 out of a total of 25,646 calls, or 41.35 per cent. The contrast in connection with car electric lighting and engine starting troubles is even more favourable to Great Britain, for while the R.A.C. figures show a proportion of 2.9 per cent. under this heading, those for Chicago work out at 19.9 per cent.

Institution Notes.

Institution of Electrical Engineers.—MERSEY AND NORTH WALES (LIVERPOOL) CENTRE.—The report of the committee for session 1924-25 was recently issued. The total membership of the Centre is now 467, including all grades. At the annual general meeting held on April 20th, the chairman (Mr. A. E. Malpas), two vice-chairmen (Mr. P. J. Robinson and Dr. F. J. Teago), hon. secretary and treasurer (Mr. Oscar C. Waygood), and four members of committee (Messrs. L. Breach, T. Cornfoot, H. Dickinson, and P. Priestly) were elected to complete the committee for the ensuing session.

LONDON STUDENTS' SECTION.—This section has decided to hold a summer meeting this year in London, in place of the usual foreign tour, and the provincial students will be the guests of the London section. The meeting will be held from July 25th to August 1st, and the preliminary arrangements include several works visits, besides a visit to the British Empire Exhibition and also a visit to the Ongar transmitting station and the Brentwood receiving station of the Marconi Co.

AWARDS FOR PAPERS.—The Council has made the following awards of premiums for papers read during the session 1924-25, or accepted for publication:—

The Institution Premium to Mr. H. W. Clothier.
Ayrton Premium to Major E. I. David.
Fahie Premium to Colonel T. F. Purves, O.B.E.
John Hopkinson Premium to Mr. G. Rogers.
Kelvin Premium to Lt.-Col. K. G. Maxwell and Mr. A. Monkhouse.
Paris Premium to Mr. D. Murray.
Extra Premiums to Messrs. J. D. Cockcroft, R. T. Coe, J. A. Tyacke, Prof. Miles Walker and Mr. S. Holmes.
Wireless Premiums to Major A. G. Lee, M.C., and Mr. A. J. Gill; Captain H. J. Round, M.C., and Messrs. T. L. Eckersley, K. Tremellen, and F. C. Lunnon; Prof. E. Mallett and Mr. A. D. Blumlein; and Mr. L. C. Pocock.

Institution of Mechanical Engineers. — On Friday last, Prof. G. Gerald Stoney, D.Sc., F.R.S., presented the fourth Report of the Steam-Nozzles Research Committee at a meeting of the Institution. It dealt with 12-degree convergent impulse nozzles with thin and thick blades, and reviewed the work done to date. It was found that a wide variation was permissible in the design of converging impulse nozzles when maximum efficiency was the first consideration. Thick plates were as good as thin plates, if chamfered at the exit. Conditions of entry and exit were important.

The work of the Committee is to be continued.

Institute of Metals.—MEMBERSHIP.—The ballot for the election of members of the Institute on May 4th resulted in the addition of the names of 53 persons to the roll. Of these, 31 are resident in Great Britain and 22 abroad. The high proportion of foreigners joining the Institute is an indication of the desire on their part to secure, through the Institute's *Journal*, information regarding non-ferrous metallurgical research work. The recent election brings the Institute's total membership to 1,614, of which 387 members are resident outside the British Isles.

Royal Institution.—The Tyndall Lectures will be delivered this year by Professor R. Whiddington, on "The Passage of Electricity Through Vacuum Tubes" commencing on Tuesday, May 19th, at 5.15. Sir William Pope will give an extra discourse, on June 12th, on "Faraday as a Chemist."

Our Personal Column.

The Editors invite electrical men, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

The Northampton Town Council has adopted a recommendation to increase the salary of the tramway manager, Mr. J. F. CAMERON, from £684 to £700 per annum.

Professor G. F. CHARNOCK, head of the Department of Civil, Mechanical and Electrical Engineering at the Bradford Municipal Technical College, is to retire at the end of the present session. He became head of the Bradford College engineering department in 1891 and on the creation of the chair of engineering he was appointed to the professorship. He will continue as a lecturer and adviser.

Mr. E. W. DICKINSON, late chief engineer at Greenwich (L.C.C.) power station, who, as stated in our issue of February 13th, has commenced practice as a consulting engineer, notifies that his business address is 20, Essex Street, Strand, W.C.2. (Telephone: "City 7014").

The *Electrical Contractor* records that Mr. T. E. ALGER, vice-president of the E.C.A. Allied Associations, has been nominated as next year's president.

The Inverness Town Council has appointed Mr. DUNCAN MACLENNAN, M.I.E.E., engineer and manager of the Alloa Electricity Department, to be engineer and manager of its electricity works at a salary of £500, with free house.

Mr. H. WARING, of Northampton, has been appointed clerk of works at the new electricity station for the Colchester Corporation.

Messrs. J. F. CROWLEY & PARTNERS have removed their offices to 11, Queen Anne's Gate, Westminster, S.W.1, where they will also have research laboratories.

Mr. R. B. LEACH, borough electrical engineer at Loughborough, has presented the local clinic for poor children with an ultra-violet ray apparatus.

Mr. W. L. TOPPLE, C.B.E., who has for the past two years held the position of works director of Fuller's United Electric Works, Ltd., has now been appointed managing director of the company.

Mr. G. F. STAITE, who has been appointed telephone traffic superintendent of the Liverpool District, joined the staff of the National Telephone Co. in 1887. When the telephones

were taken over by the Post Office he was appointed traffic superintendent at Manchester, which position he now vacates. His predecessor at Liverpool, Mr. A. E. Coombs, has been appointed district manager at Glasgow.

Mr. P. M. EDINBOROUGH, for the last five years works manager of the electric heating and cooking department at the Cosmos Lamp Works, has been transferred to the head office of the Metro-Vick Supplies, Ltd., and appointed supply leader of the domestic appliance sales department. On leaving the Cosmos works he was presented with a pipe set and umbrella by the staff and employés of the electric heater department. Mr. J. J. MCKENNA, who has resigned his position with the Brompton and Kensington Accessories Co., has joined the electric heating and cooking department of the Cosmos Lamp Works.

The *Australian Electrical Times* states that Mr. J. C. FORSYTH has been appointed city electrical engineer at Christchurch, N.Z., where he has been assistant electrical engineer for the past 4½ years. He was formerly with Messrs. Bruce Peebles & Co., Edinburgh, but is a New Zealander by birth. Mr. G. H. Battersby has been appointed assistant electrical engineer.

Mr. H. NIMMO, M.I.E.E., M.I.Mech.E., electrical engineer to the Government of Burma, who recently proceeded on eight months' leave to England, expects to arrive in London on May 16th. His address is care of Barclay's Bank, 54, Lombard Street, London, E.C.

Mr. GEORGE G. BRAID has resigned from the position of chief engineer to the Glasgow Corporation Tramways Department, a position to which he was appointed about two years ago, and he is stated to intend to devote himself to the study of scientific and industrial economics.

The Hazel Grove and Bramhall Urban Council has appointed the following as the permanent staff of the electricity undertaking:—General manager, Mr. ALFRED TURNER, salary £350 per annum; manager's clerk, Mr. D. O. PERCIVAL; plumber-jointer, Mr. C. SADLER, salary £234 per annum; general assistants, Messrs. J. MITCHELL and F. TWIGG.

The Establishment Committee of the London County Council recommends the appointment of Mr. BOYDELL SHALLIS, M.B.E., A.M.I.E.E., to the post of technical assistant in the second class of the chief engineer's department, at a commencing salary of £286.

Mr. CHAS. F. TRIPPE has recently joined the Radio Accessories Co., Ltd.—a new proprietary company of Burndept Wireless, Ltd. For many years past Mr. Trippe has been prominently associated with the General Electric Co., Ltd., in numerous capacities. Born in the original Atlantic Cable Station in Newfoundland, to which station his father sailed in the *Great Eastern* cable ship,, he jointed the Atlantic Cable Service, and served one year on the c.s. *Minia*, before joining the General Electric Co., Ltd., in 1895. Mr. Trippe served with the forces during the war, and was principally concerned with the application of valves to wireless sets, to which he has also devoted himself since his return.

Mr. JAMES GRAY has been appointed chairman of the Madras Electric Tramways (1904), Ltd., and Col. G. R. C. WESTROP has been elected a director of the Madras Electric Supply Corporation, consequent upon the death of Mr. A. M. Quill, which was mentioned in our reference to the report of the Tramways Co. (ELEC. REV., May 8th, p. 746).

Mr. J. H. SANDIFORD's business address is now c/o Messrs. Ferranti, Ltd., Bush House, Aldwych, London, W.C.2.

The Times states that Mr. FISK, the Australian wireless expert, is about to sail from Sydney for London in connection with the establishment of wireless stations in the Empire.

Obituary.—MR. T. LAURIE.—We regret to learn of the death of Mr. Thomas Laurie, a member of the firm of Messrs. Thomas Laurie & Co., electrical and automobile engineers, Falkirk. A correspondent states that Mr. Laurie was regarded as a pioneer of electric lighting in Stirlingshire.

HERR I. WINKLER.—The death is announced from Berlin of Herr Ignaz Winkler, of the Siemens-Schuckertwerke Gesellschaft. The deceased was an authority on electric tramway construction.

MR. A. E. WELLS.—Mr. A. E. Wells, managing director of Edgar Allen & Co., Ltd., of Sheffield, passed away at Rotherham on Monday in his 68th year.

New Companies Registered.

Medical Engineering Co., Ltd. (205,775).—Private company. Registered May 7th. Capital, £5,000 in £1 shares. Objects:—To acquire the assets and liabilities of the Medical Engineering Co. and to carry on the business of electrical and mechanical engineers, inventors, patentees, manufacturers and dealers, &c. The directors are:—A. E. Dean, Leigh Place, Brooke Street, Holborn, E.C.1, electrical engineer; C. E. Lawrence, 34, Lorne Gardens, N.W.8, electrical engineer; F. A. Nash, 20, Balmoral Road, E.10, accountant. Qualification, 250 shares. Secretary: F. A. Nash. Registered office: 71a, Englefield Road, N.1.

Benn, Baskerville & Co., Ltd. (205,800).—Private company. Registered May 8th. Capital, £1,000 in £1 shares. Objects:—To carry on the business of electrical engineers, contractors, and manufacturers and merchants of electrical goods and wireless, telegraph, and telephone apparatus, &c. The permanent directors are:—H. L. Benn, 69, Hoole Road, Chester, wireless engineer; R. H. Baskerville, A.M.I.M.E., 63, Hoole Road, Chester, mechanical engineer. Qualification, 50 shares. Secretary: R. H. Baskerville. Solicitors: J. Thornley Lingard, 5, John Dalton Street, Manchester.

C. and G. Manufacturing Co., Ltd. (205,782).—Private company. Registered May 7th. Capital, £900 in 400 7 per cent. participating cumulative preference and 200 ordinary shares of £1 each. Objects: To adopt an agreement with A. C. Slipper and to carry on the business of electric lock manufacturers referred to therein, &c. The directors are:—C. A. Gibbes (chairman), address not stated; A. C. Slipper, 71, Montpelier Road, Brighton, Sussex; F. G. V. Gibbes, Pages Farm, Stebbing, Essex. The last two named are joint managing directors. Qualification, £100 shares. Solicitors: Woodcock, Ryland and Parker, 15, Bloomsbury Square, W.C.1.

Socrim, Ltd. (205,743).—Private company. Registered May 5th. Capital, £1,000 in £1 shares. Objects: To carry on business as dealers, merchants, importers, exporters and agents in and manufacturers of gas, and electric light and heating and electric, magnetic, galvanic, oil, steam and wireless and other apparatus, fittings and accessories, &c. The directors are:—D. Mandler, 233, Borough High Street, S.E.1, merchant; F. W. H. Gunther, 27, Tyson Road, Forest Hill, S.E.23, merchant. Qualification, £1. Remuneration, 5 guineas per annum. Secretary: F. Gunther. Solicitors: Cubison & Christie, 69, Lincoln's Inn Fields, W.C. Registered office: 62, Bartholomew Close, E.C.

Wakelin's Wireless Co., Ltd. (205,721).—Private company. Registered May 4th. Capital, £2,500 in £1 shares (1,250 preference and 1,250 ordinary). Objects:—To carry on the business of manufacturers of and dealers in all apparatus for use in connection with wireless telegraphy, telephony, and television, manufacturers of and dealers in electrical appliances and machinery, dealers in musical instruments, &c. The directors are:—W. F. Wakelin, 359, Norwich Road, Ipswich; J. R. Powell, 225, Bramford Lane, Ipswich; S. G. Keeble, 231, Foxhall Road, Ipswich; W. F. Clarke, 43, Roundwood Road, Ipswich. Qualification, £10 shares. Secretary: W. F. Clarke. Solicitors: W. T. F. Block, Arcade Chambers, Ipswich. Registered office: 74, Norwich Road, Ipswich.

Excel Radio Units, Ltd. (205,708).—Private company. Registered May 4th. Capital, £500 in £1 shares. Objects: To acquire from W. J. S. Clemmey and W. L. Turner the patent and other rights and interests in an invention for improvements in or connected with receiving apparatus for wireless telegraphy or telephony, and to carry on the business of manufacturers of and dealers in apparatus, fittings and articles required in or connected therewith, &c. The directors are:—E. G. Pulford, A.M.I.E.E., 108, Whitechapel, Liverpool, electrical engineer; W. G. S. Clemmey, 27, Merton Road, Bootle, medical student; W. L. Turner, Purley, Caldy, Cheshire, metallurgist; all permanent. Qualification, 100 shares. Remuneration as fixed by the company. Secretary: A. H. Davies. Solicitor: F. R. Locke, 9, Cook Street, Liverpool.

District Lighting Supply, Ltd. (205,673).—Private company. Registered May 2nd. Capital, £1,000 in £1 shares. Objects: To acquire the business carried on by B. Apple at 87, Tottenham Court Road, W., as the District Lighting Supply, and to carry on the business of dealers in lighting and heating supplies and appliances, electrical and wireless appliances and accessories, machinery and tools, engineers, smiths, &c. The directors are:—B. Apple, 87, Tottenham Court Road, W.1, dealer in lighting supplies; Mrs. Helen Apple, 87, Tottenham Court Road, W.1. Solicitor: A. Rubens, 76, Newgate Street, E.C.1. Registered office: 87, Tottenham Court Road, W.1.

Official Returns of Electrical Companies.

Carter & Co. (Nelson), Ltd.—Mortgage dated April 24th, 1925, to secure £650 and further advances, charged on 11, Albert Road, Colne. Holders: Marsden Building Society, 2, Russell Street, Nelson.

E. & C. Gates, Ltd.—Particulars filed of £4,000 debentures authorised by resolutions of April 4th and 7th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being issued.

Ingleby & Co., Ltd.—R. E. Starkie, of 6, South Parade, Leeds, incorporated accountant, was appointed receiver on April 22nd, 1925, under powers contained in debentures dated April 1st, 1920.

A. Behm (London), Ltd.—W. Strachan, incorporated accountant, of 50, Gresham Street, E.C., was appointed receiver and manager on April 30th, 1925, under powers contained in debenture dated July 16th, 1924.

Bell Battery and Accessory Co., Ltd.—F. Wilcock, of 1, Great Winchester Street, E.C., was appointed receiver and manager on April 24th, 1925, under powers contained in debenture dated July 30th, 1924.

Luminor Signs (British), Ltd.—J. Bennett, of 39, Lawn Road, Uxbridge, was appointed receiver on April 20th, 1925, under powers contained in debenture dated September 15th, 1922.

Summers Electric and Engineering Co., Ltd.—H. W. Batty, of 146, Bishopsgate, E.C.2, was appointed receiver on April 24th, 1925, under powers contained in debenture dated October 1st, 1924.

Midland Valves, Ltd.—Satisfaction in full on April 9th, 1925, of debenture dated November 7th, 1923, securing £600.

Empson Electrical Engineering Co., Ltd. (188,281).—Return dated June 13th (filed November 14th), 1924. Capital, £2,000 in £1 shares. All shares taken up. £500 paid. £1,500 considered as paid. Mortgages and charges, nil.

Stevenage Electric Light & Power Co., Ltd. (188,001).—Return dated August 7th (filed October 21st), 1924. Capital, £12,000 in £100 shares. All shares taken up. £12,000 paid. Mortgages and charges, nil.

Rhayader Electric Light & Power Co., Ltd. (188,601).—Return dated September 22nd, 1924 (filed January 12th, 1925). Capital, £2,000 in £5 shares. 189 shares taken up. £945 paid. Mortgages and charges, nil.

Dolywern & District Electricity Supply Co., Ltd. (187,790).—Return dated February 2nd, 1925. Capital, £1,000 in £1 shares. 500 shares taken up. £500 paid. Mortgages and charges, nil.

Simmonds & Stokes, Ltd. (196,811).—Return dated February 13th, 1925. Capital, £10,000 in £1 shares. 7,521 shares taken up. £1,521 paid. £6,000 considered as paid. Mortgages and charges at date of return, £6,350 (£1,000 since paid off).

Satisfaction to the extent of £1,000 on April 16th, 1925, of debentures dated April 15th, 1924, securing £7,000.

H.P. Electrical Co., Ltd. (187,715).—Return dated September 15th, 1924. Capital, £1,000 in £1 shares. 654 shares taken up. £654 paid. Mortgages and charges, nil.

Sherborne Electric Supply Co., Ltd. (187,590).—Return dated April 2nd, 1925. Capital, £15,000 in £1 shares. 12,031 shares taken up. £12,031 paid. Mortgages and charges, nil.

City Notes.

Lancashire Electric Light and Power Co., Ltd.

The directors' report for the year ended March 31st last shows that the trading profit of the Parliamentary Company (the Lancashire Electric Power Co.), plus interest receivable, was £168,592, and with £6,047 brought forward there is an available balance of £174,639. From this £58,435 has been transferred to the depreciation fund and £8,098 to the income-tax reserve, and £9,376 is being carried forward, leaving a balance of £98,730, which, with management fees, has been paid to the Light and Power Co. in respect of interest and dividend for the year to December 31st, 1924. The balance at the credit of the profit and loss account of the latter company is £100,663 and the addition of £7,661 brought forward makes £108,324. Interim preference dividends, &c., absorbed £35,744, and it is proposed to pay a final dividend at the rate of 6 per cent., tax free, on the cumulative first preference shares (£10,229); a final dividend at the rate of 8 per cent., less tax, on the 7 per cent. cumulative participating preference shares, making 7½ per cent. for the year (£17,438); and a dividend at the rate of 7½ per cent., less tax, on the ordinary shares, £36,535; leaving £8,378 to be carried forward. Arrangements have been made to give a supply in the district lying between Chorley and Preston, where a large amount of power is used for industrial purposes. The erection of the Padiham station, near Burnley, is being proceeded with by the Parliamentary Company, and it is anticipated that it will be put into commission about the middle of next year, enabling the company to develop the northern portion of its area. Arrangements have been made for giving a bulk supply from the station to two local authorities. Further capital will be required to meet the expenditure involved in the works referred to, and to provide for the normal extension of the company's existing system. A table appended to the report shows that the amount of energy generated or purchased by the Parliamentary Company rose from 105,254,140 kWh in 1923 to 130,043,552 kWh in 1924; the maximum load increased from 49,650 h.p. to 60,930 h.p.; and the connected load from 68,630 h.p. to 79,900 h.p.

Pernambuco Tramways and Power Co., Ltd.

The annual meeting was held on May 5th, Mr. W. Higgins, O.B.E., presiding. In presenting the report and accounts (*vide* ELEC. REV., May 1st, p. 708), the chairman said that he had been elected to the position rendered vacant by the retirement of Mr. Follett Holt through the pressure of other duties. Turning to the accounts, he pointed out the difference in the exchange value of the milreis in 1913 and to-day. In the former year its value was 16d., at present it was about 5½d. Exchange was the crux of their whole business; as the late chairman had said, if the exchange took a favourable turn the company would be able to return to a dividend-paying basis. As it was, during the past year they had been able to wipe out a deficit of £24,000 and also to contribute £10,229 to the capital reserve account. In addition, they had carried out their obligations in respect of the sinking fund under the deed covering the security of the 8 per cent. prior lien debentures, and were carrying forward to the revenue account a balance of £4,863. Further growth of business was registered by the tramway and power undertakings; since their inception they had never looked back. The gas undertaking, which had been acquired to obtain the exclusive rights of lighting and power supply, did not show the progress for which they hoped, although it undoubtedly gave the company indirect benefits. As regarded the telephone system, the concession for which was to expire 25 years after the date of its acquisition by the company, 1914, negotiations were proceeding with the Pernambuco State Government by which it was hoped to secure an extension of tenure. If this was obtained the company intended to proceed with an automatic exchange. This would entail considerable expenditure and lead to the capital reconstruction of the telephone company.

Pernambuco, with a population of 350,000, was one of the most important cities in northern Brazil, and during the last ten years it had developed to a remarkable extent. Whatever steps were taken for the benefit of the community must ultimately be of good to the company's undertaking. Brazil itself possessed unlimited natural resources and all that was wanted was development. Capital for this could be found here if a reasonable security and return could be obtained. If the recommendations of the British Commercial Mission were adhered to Brazil would emerge from her present financial position and take her proper place as one of the greatest countries in the world.

English Electric Co., Ltd.

The report for the year ended December, 1924, which was submitted at the annual meeting held on Wednesday, showed a balance to the credit of profit and loss account (including £69,714 brought forward), of £333,494 (as compared with £330 776 in the previous year). From this the following are deducted:—Interest on 5½ per cent. sinking fund first mortgage debentures, £47,641; interest on 6 per cent. convertible debenture stock, £79,000; written off expenses of issue of second debentures, £9,007; trustees' fees, £435; dividend (6 per cent. per annum) on the preference shares, £59,014; leaving £138,398. The directors recommended a dividend on the ordinary shares at the rate of 5 per cent. per annum, less tax, absorbing £64,481, carrying forward the balance of £73,917. The directors state:—"The considerable increase in orders mentioned in our last report together with certain large contracts secured in the early part of the year under review, made it imperative for the company immediately to increase its productive capacity. Considerable extensions and additions were made at our Stafford and Preston works, and the cost of these improvements is included in the increase of £152,000 in the value of 'Land, Buildings, Plant, Machinery, &c. This extra capacity became productive in the early autumn and is working at full output. Arrangements having been made to liquidate the Coventry Ordnance Works, Ltd., and to complete the liquidations of Dick, Kerr & Co., Ltd., the Phœnix Dynamo Manufacturing Co., Ltd., and the United Electric Car Co., Ltd., the board will present the accounts for the year 1925 in the form of a consolidated balance sheet in which the asset 'Interest in Subsidiary and other Companies' will be adjusted accordingly. . . . The outstanding 8 per cent. notes shown in the 1923 balance sheet have now been redeemed. This marks the conclusion of the satisfactory financial operations referred to in our last report. As a result of the redemption of the 8 per cent. notes by the issue of 6 per cent. convertible debentures a reduction in the debenture interest charges of the company and its subsidiaries of £42,321 came into operation in the year under review. The development of the technical side of the business, particularly as regards railway electrification and water power plant, has made very substantial progress, and the successful operation of various types of plant embodying the company's latest designs has done much to expand both technically and geographically the scope of the company's operations. In order that full advantage can be taken of these increased opportunities new branches have been established abroad and our technical sales organisation further strengthened." The report when circulated to shareholders was accompanied by a copy of the company's *Journal* for March, containing excellently illustrated particulars of English Electric manufactures.

The dividend for the previous year was at the same rate.

Johnson and Phillips, Ltd.

The annual meeting of this company (whose report was reviewed in our issue of May 1st, p. 708), was held on May 7th, Mr. W. Claude Johnson (chairman), presiding. The chairman, in the course of his yearly statement reviewing the position of the company, said that the share capital had been increased from £437,500 to £500,000 by the issue of 62,500 new shares at 22s. per share in December last. Sundry creditors and reserve for contingencies, at £214,881, had increased by £73,979; this was entirely due to the very large increase in the volume of orders in hand at the end of the year. On the other side of the account, sundry debtors at £342,802, also showed an increase of some £124,000. Stock in trade and work in progress increased roughly £46,000, and, as the value of the stocks of raw materials was actually some £16,000 less than the previous year, it followed that the work in progress was £62,000 or so more, which was a pleasing sign, as it represented expenditure on the larger amount of orders in hand at the end of the year not invoiced to customers, so the current year would reap the benefit of all this. Investments at £31,201 were some £76,500 lower than the previous year, some of the investments having had to be realised to provide the money required to finance the very much larger volume of work going through the shops. An agreement had been arrived at with the holders of the 8 per cent. debenture stock whereby the interest payable on the outstanding stock would be reduced to 6 per cent. as from July 1st next. The directors considered the profit made during the year highly satisfactory, and although it was nearly double that of the previous year, they confidently anticipated that the current year would produce better results still; in fact, the first four months of this year had shown record figures, and they had every reason to hope and expect that the improvement would be continued. Export business, so important from the national point of view, and to the expansion of which they had directed strenuous exertions ever since the war, had contributed largely to the turnover for last year, and still more to the current year's business. Some 20 to 25 per cent. of their production was for abroad, and the proportion tended to increase. The execution of the large contract for cable for the South-Eastern Railway electrification was proceeding very satisfactorily, but no proportion of the profit on it had been taken into account in the figures now before them. They had every reason to be fully satisfied with their participation in the British Empire Exhibition, at which they received a large number of engineers both from this country and also from overseas. The firm's relations with its workmen and staff had again been exceedingly satisfactory throughout the year. The sports ground which had been provided for the staff had proved a great success, and had contributed considerably to the feeling of good fellowship as well as to the health and efficiency of the employés. In 1925 the company reached its Jubilee year. During those fifty years they had grown from small and modest beginnings in an infant branch of engineering to an important and recognised position in a giant staple industry. Electrical engineering might now be said to be the most important section of the engineering industry; it penetrated and permeated all other sections, and was closely allied with every

one of our industries, arts and sciences as an indispensable servant. They were engaged in an industry which was still rapidly expanding, and destined to expand with cumulative effect through an indefinite period of years. In this country we were reproached as being far behind other nations, even much poorer nations, in the extent of our use of electricity. That was doubtless true, though it was due not to lack of enterprise but rather to the fact that we were industrially developed earlier than other nations, and were in possession of equipment of a less modern but still reasonably efficient kind when other nations were just commencing to equip themselves. Having nothing to scrap, they could begin with the latest inventions right away, whereas we had much capital invested in the older equipment for power, lighting and communications. But it was fully recognised that sooner or later the older plant must go, and there was so much leeway to be made up that the country's low state of saturation in electrical matters might in a sense be said to be an asset to British electrical manufacturers. Then there were their large markets overseas, particularly in the Dominions, whose development, great as it had been, touched admittedly but the fringes of their potentialities. No doubt they and other countries would do an increasing share of their own manufacturing, but the skill in design and workmanship for which British engineering had always been justly renowned was not acquired in a day, and they were confident that their services in this line would long be required. The great improvement shown in their accounts was very largely attributable to the output from the new shops erected and equipped with the latest and most modern labour-saving machinery during the previous year. Those new shops were now in full operation, and they confidently expected still better results for the current year. They had also completed the purchase of a small works close to their own factory in order to be the better able to cope with the big increase of business in view. The managing director (Mr. John Macgregor), in seconding the motion, said that the board's policy in building up a strong financial position had paid, and the shareholders who had invested their money in the company, and allowed profits earned to remain in the business, might now look forward to a further reward for their foresight and patience. A shareholder asked whether, in view of the optimistic spirit that prevailed, the directors would consider the payment of an interim dividend. The chairman replied that the board considered that it would not be wise to take such a step. The report and accounts were adopted.

Barcelona Traction, Light, and Power Co., Ltd.

The report for the year 1924 covers the operations of the Union Electrica de Cataluña and the Energia Electrica Cataluña for the first time since the acquisition of these undertakings. The revenue, apart from that of the above-named concerns, was $2,999 287, and the balance, after deducting administration expenses, &c., was $2,493,760. Bond service absorbed $2,419,088, leaving a balance of $74,672. The Union Electrica de Cataluña earned a net profit of 3,863,759 pesetas. Of this amount Ps. 2,454,108 was devoted to the payment of bond interest, &c., and the remainder has been applied to paying off the balance of the loans outstanding in connection with the acquisition of shares of the Energia Electrica. A dividend of 5 per cent. received on the company's holding in the Energia Electrica has been applied in payment of a call of 24 per cent. on partly paid shares of the Energia Electrica. The sale of the Barcelona Company's holding of 60,000 shares in the Tramways de Barcelone was successfully carried through during the year. Apart from the last-named company and the Union Electrica and Energia Electrica Companies, the net earnings of the combined undertakings in Spain increased by Ps. 4,525,916. Since the close of the year the preference shares of the company have received a dividend of 1 per cent., and it is hoped to be able to pay four such dividends during the current year.

Birmingham District Power and Traction Co., Ltd.

After deducting income tax and payments to local authorities, there was a surplus of £98,911 for the year 1924, and to this is added £11,023 brought forward, making £109,934. After providing for debenture interest and sinking fund, preference dividend and renewals, there remains £67,815, which it is proposed to distribute as follows:—To reserve, £2,378; to a dividend of 5 per cent. on the ordinary shares, £20,648; carried forward, £44,789. The tramway receipts were lower owing to the lapsing of a lease of about 1¼ miles of track in West Bromwich. The undertakings have been seriously affected by motor-omnibus competition. Agreements have been entered into with subsidiaries providing, *inter alia*, for the pooling of receipts and expenses and the division of the surplus on an agreed basis. Meeting, May 19th.

West Gloucestershire Power Co., Ltd.

The annual meeting of the company was held at Gloucester on May 9th, Mr. J. Davidson presiding. The chairman, in the course of his speech, said that the undertaking was taken over from the contractors in June last, and the station and plant were of the most modern construction and design. Few troubles had been experienced in starting up the plant, and the methods of transmission and the existence of stand-by plant ensured uninterrupted supplies to consumers. The results for the six months were no indication of the revenue-earning capacity of the station. The revenue for the current year would depend on the rapidity with which the management was able to load up the plant, and the extent of consumers' requirements. There was every indication that the plant would be overloaded, and they had therefore applied to the Electricity Commissioners for sanction to install an additional 10,000 kW of plant. The company had been given every facility for the erection of its transmission lines, and in no case had it had to resort to its statutory right of obtaining compulsory wayleaves. The company had also approached the Commissioners with a view to the extension of its area of supply—in the north to bring it up to the boundary of the Shropshire, Worcestershire, and Staffordshire Co.'s area, and in the west up to the boundary of supply of the South Wales Power Co. It was possible that in the future supplies would be interchanged with these companies. In conclusion, the chairman paid a tribute to the staff and to the company's advisers, Mr. Arthur Ellis and Mr. W. B. Woodhouse.

Ever Ready Co. (Great Britain), Ltd.

The profit for the year ended March 31st last was £95,683, and to this is added £15,947 brought forward, making £111,630. This is allocated as follows:—General reserve, £25,000; reserve for contingencies, £10,000; preference dividends, £16,589; distribution on the ordinary shares for the year (15 per cent.), £37,350; carried forward, £22,691. The report states that the year was one of considerable progress. During the year the superior lease of the Holloway works was acquired. A considerable increase in the Australian business necessitated additional capital expenditure amounting to £10,000. The undertaking of a company carrying on a similar business in the Midlands was acquired for £45,500 in cash and 31,249 of the company's preference shares; satisfactory initial progress has been made in the reorganisation and extension of this subsidiary. Extensions to the different factories in hand or in prospect will entail a capital expenditure of £20,000 during the current year. Meeting, May 28th.

United States Companies.

Commonwealth Edison Co.—The report for 1924 shows a net revenue of $20,347,231 and a gross revenue of $53,672,442. The net operating income, after providing for taxation, bad debts, &c., was $14,026,093, and to this were added other amounts received, and interest, &c., was deducted, leaving $9,107,919. Dividends absorbed $6,230,288, and the balance ($2,877,631) was added to the surplus, making it $15,563,361.

Pacific Gas and Electric Co.—The gross revenue for 1924 was $44,451,586, and the net earnings (including miscellaneous income) were $16,732,323. After providing for bond interest, &c., and allocating $3,057,417 to depreciation, there remained a surplus of $7,028,349. The preference dividend absorbed $3,244,608, and a dividend of 8 per cent. on the common stock $3,040,123, leaving a balance of $743,618.

German Companies.

The directors of the *Voigt and Haeffner Company*, of Frankfort-on-Main, recommend a dividend at the rate of 8 per cent. for 1924 on the ordinary share capital of 7,500,000 marks.

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The *Saxony Works Company*, of Dresden, which incorporates the electricity works and collieries of the State of Saxony, reports net profits of 1,821,000 marks for 1924 and a dividend at the rate of 10 per cent.

The *Electra Company*, of Dresden, proposes to pay a dividend at the rate of 10 per cent. for the last nine months of 1924, out of net profits amounting to 835,000 marks.

The *United Insulator Works Company*, of Berlin, which is in the Electrical Undertakings Company group, reports net profits of 2,235 marks on a share capital of 1,000,000 marks.

The *German Cable Works Company*, of Berlin-Lichtenberg, reports net profits of 395,000 marks for 1924, permitting of the payment of dividends at the rate of 6 per cent. on the preference shares, plus 6 per cent. from arrears, and at the rate of 6 per cent. on the ordinary shares. With the opening of the new cable factory at Ketschendorf, the productive capacity of the undertaking has been doubled. The directors state that activity has materially increased in the current year and the turnover is twice that in the corresponding period of last year.

Anchor Cable Co., Ltd.—The report for the year ended December, 1924, which was submitted at the annual meeting held yesterday (Thursday) at Hamilton House, E.C., states that the profit was £66,123. Deducting £2,250 for debenture interest and adding £99,133 brought forward from 1923, leaves available £163,007. 20 per cent., less income tax, on the shares of the company requires £13,000, and £150,007 is to be carried forward. Sales again improved during the year, and this improvement is reflected in the increase in the profits. It has not been thought necessary to set aside any further sum for depreciation this year, as the figure at which the property stands in the book is an extremely conservative one.

Calcutta Electric Supply Corporation, Ltd.—The directors recommend a final dividend of 8 per cent. on the ordinary shares, making 12 per cent. for the year, less tax at the rate of 2s. 3d. in the £. The dividend for 1923 was 11 per cent.

Craigpark Electric Cable Co., Ltd.—The report for the year ended March, 1925, which was submitted at the annual meeting held in Glasgow yesterday (Thursday), showed a net profit of £9,310 (after providing for corporation profits tax), plus £1,357 brought forward, making £10,668. £2,000 is appropriated for depreciation of buildings and machinery; a 6 per cent. preference dividend absorbs £2,850; 10 per cent. is to be paid on the ordinary shares, requiring £3,750; and £2,068 carried forward, subject to directors' fees. A new Article is to be added giving the directors power, as found expedient, to capitalise and distribute as bonus part of the reserves.

Chloride Electrical Storage Co., Ltd.—A dividend of 10 per cent., actual, and a bonus of 2s. per share, both free of tax, have been declared. A dividend of 5 per cent., actual, free of tax, was declared in November last, so that the total distribution for the year ended March 31st equals 25 per cent., tax free, as against 20 per cent., tax free, in the preceding year.

Anglo-American Telegraph Co., Ltd.—Dividends totalling 6 per cent. on the preferred stock, 3¾ per cent. on the ordinary stock, and 1½ per cent. on the deferred stock have been paid in respect of the past year. These, together with income tax, absorbed £262,500, being the rent paid by the Western Union Telegraph Co. for the year. The balance at credit of the revenue account (£68,945) includes £3,320 interest received, and the balance of £65,625 is available for payment of dividends for the quarter ended March 31st last.

Anglo-Portuguese Telephone Co., Ltd.—The gross income for 1924 (converted into sterling at the rate of 134.15 escudos to the £) was £80,566, and the expenditure £68,433, leaving a gross profit of £12,133, as against £2,710 in the preceding year. The net profit, after providing for debenture interest, &c., is £5,804; there was a net loss of £7,200 in 1923. The capital expenditure during the year was £60,774. Meeting: May 18th.

Canadian General Electric Co.—The report for 1924 shows a profit of $1,593,631, from which are deducted $600,000 for depreciation and $578,473 for interest and exchange, leaving $578,473. Adding $6,629,769, surplus from preceding years, the amount available is $7,208,242. After providing for dividends on the preferred and common stock and transferring $3,951,909 to the general reserve, there remains a surplus of $2,744,105.

Siemens Bros. & Co., Ltd.—Final dividend of 5 per cent. on the ordinary shares, making 7½ per cent. for the year.

Brush Electrical Engineering Co., Ltd.—The annual meeting was held on May 11th; a report will appear in our next issue.

Tramways and Light Railways Estates Co., Ltd.—The available balance from 1924 was £684, and the addition of £234 brought forward makes £918. It is proposed to reduce the goodwill by £100, to pay a dividend of 4 per cent., and to carry forward £215.

Tottenham District Light, Heat and Power Co.—It is reported that the recent offer of £150,000 of 5½ per cent. irredeemable preference stock was greatly oversubscribed. The average price of the accepted tenders was £102 6s. 10d. per cent.

Reduction of Capital.—GREENWICH CABLE WORKS, LTD. AND REDUCED.—A petition for the confirmation of the reduction of the capital of the company from £125,000 to £56,013 has been presented to the High Court and will be heard in London on May 19th.

W. T. Henley's Telegraph Works Co., Ltd.—Final dividend on the ordinary shares for the year 1924, of 2s. per share, less income tax, making, with the interim dividend, 3s. per share for the year; also a dividend of 1s. per share, less income tax, for the three months ended March 31st, 1925.

Luxemburg Company. — The *Société Luxembourgeoise pour Entreprises Electriques* reports a net profit of 404,763 fr. for the last financial year, as compared with 362,287 fr. in 1923. The dividend is being increased from 10 to 11 per cent.

Swiss Company.—The report of the *Bernische Kraftwerke Gesellschaft*, of Berne, shows that the receipts from current supplied and other sources advanced from 15,963,094 fr. in 1923 to 16,979,246 fr. in 1924. The net profit for the year amounted to 2,967,881 fr., enabling a dividend of 6 per cent. to be paid.

Canadian Westinghouse Co., Ltd.—The gross earnings of this company during 1924 totalled $1,541,369, and the net profits $1,139,369. Dividends amounting to 10 per cent. were paid for the year, and a balance of $396,079 was added to the surplus, making it $3,287,444.

Adelaide Electric Supply Co., Ltd.—The usual interim dividend of 6 per cent., free of British tax, has been declared on the ordinary shares.

Melbourne Electric Supply Co., Ltd.—An interim dividend of 5 per cent., free of British tax, has been declared on the consolidated ordinary stock.

Glenfield & Kennedy, Ltd.—A final dividend of 7½ per cent. has been declared, making 10 per cent. for the year, as compared with 5 per cent. in 1923.

Belgian Company.—*La Société d'Electricité du Pays de Liége* reports a net profit of 2,686,133 fr. for the last financial year, as compared with 2,274,162 fr. in 1923.

Stocks and Shares.

MONDAY EVENING.

AFTER-effects of the Budget linger in Stock Exchange markets in the shape of dullness amongst gilt-edged and investment stocks and shares. This is owing, of course, to the measures that are being taken for re-establishment of the gold standard, which have the effect of causing a temporary hardening of rates in the Money Market. More indirectly, the effect is felt in the reluctance of investment to employ its money in Stock Exchange channels during the period of transition, the reason being that, if the Money Market is likely to remain disturbed, there might be conceivably a rise in the Bank rate, with its usual sequel of declines amongst investment stocks and shares.

It would appear from two or three speeches recently made in the House of Commons that the Government wish is for the Bank rate not to go over 5 per cent. Unofficially, a Treasury suggestion has been circulated that, while the gold standard is being set up, it will be of service for investment money to go into British stocks and shares rather than into those of foreign countries, more especially of America, the recommendation being due to the desire to keep money, as much as possible, over here and to prevent its export to other countries.

Electricity supply shares maintain their prices without showing noticeable alteration on the week. Chelseas at 37s. 6d. are 1-16th down, and London Electrics eased off to 35s., though London Electric Preference have strengthened to 5⅛. St. James's at 13⅜ are ¼ better, and Yorkshires strengthened to 31s. On the other hand, Edmundsons are a little easier at 23s. 6d. Calcutta Electric Supply shares are distinctly better at 26s. 3d., on an increase of 1 per cent. in the dividend, making 12 per cent. for the year. This is less tax at 2s. 3d. in the £. Madras Electric are also better at 23s. 3d. Melbourne Electric Ordinary put on 5 points at 150. The company has declared its usual interim dividend of 5 per cent., tax free, on the consolidated ordinary stock, and the Adelaide Electric Supply announces an interim dividend of 6 per cent., tax free, the same rate as before. Isle of Thanet Preference are better at 22s. The Lancashire Electric Light & Power Co. maintains its dividend, and shows a useful expansion in its sales. The company is likely to make a new issue of capital in order to provide for extension of its operations.

In the manufacturing group, General Electrics have strengthened to 23s. 9d. buyers, expectations of an increased dividend to 7½ per cent. being current in the market. Some guess that the dividend will be 7 per cent.; others put it at a possible 10 per cent., but the remarkably good showing made by various other manufacturing concerns in their recent reports is considered sufficient justification for the price to advance, even if the dividend should prove to be modest. Johnson & Phillips have spurted to 36s. 3d., thanks, of course, to the doubling of the dividend and the first-rate report that appeared directly afterwards. British Aluminium are better at 32s. 6d.

In the cable group, prices are rather firmer than they look. India Rubbers at 22s. 6d. show a gain of 2s., while Henleys and Callenders are higher, although the nominal quotations are left unchanged. Babcock & Wilcox gave way to 2½, in consequence of the continued gloomy condition of the heavy industries, a condition to which the Pease & Partners' report, just out, contributes a melancholy addition by showing the company to have barely earned its debenture interest. British Electric Traction Ordinary strengthened to 108½, and the transport issues generally are a shade better. There has been sharp recovery in most of the Home Railway stocks. Metropolitans gained a point at 77. Districts remained steady at 48½, and the Undergrounds show no quotable changes.

Marconis are 1-16th up at 33s. 9d. Radio Common at 11½, the Preference at 10½, and Canadian Marconi at 5s. are attracting languid notice, but the wireless market as a whole is very quiescent. The Eastern Cable group of stocks and shares has scarcely varied. It is reported from Washington that the projected new Western Union cable from New York to England will have the extraordinary capacity of 2,500 letters per minute. The company is said to have under consideration a sub-division of the cable into different channels, to be used by news organisations, the Stock Exchange, and private concerns.

The English Electric Co. reports a modest increase in its total profits, these being £263,781 for 1924, an advance of about £2,000. The dividend is left at 5 per cent. on the ordinary shares. Redemption of the outstanding 8 per cent. notes and their replacement by 6 per cent. convertible debentures will effect a saving in debenture interest charges of £42,000. Next year's dividend should show an increase, otherwise the present price of 17s. 9d. looks high enough. Siemens retain their substantial rise at 27s., and Automatic Telephones keep good at 42s. 6d. International Automatics are slightly firmer at 25s. 6d., but there is nothing doing in them. The main feature amongst industrials is the buoyancy of rubber shares. Prices responded gamely to a violent rise in the price of the raw product. Those Stock Exchange firms whose clients are interested to a large extent in rubber shares have found their energies called upon to deal with a volume of business greater than they have hitherto experienced.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price May 11 1925.	Rise or fall.	Yield. p.c.
Bournemouth and Poole ...	1	13	14	2 13/16	—	4 19 7
Brompton Ordinary	1	10	10	1 1/2	—	*5 14 3
Charing Cross Ordinary	1	14 1/4	15	45/9	—	6 11 2
do. do. do. 4½ Pref.	1	4 1/2	4 1/2	17/6	—	5 2 10
Chelsea	1	12	12	1 5/8	— 1/16	6 8 0
City of London	1	15	15	2 1/8	—	6 9 10
do. do. 6% Pref. ...	1	6	6	23/6	—	5 2 2
Clyde Valley	1	8	8	32/6	—	4 18 6
County of London	1	15	15	53/9	—	5 11 6
do. do. 6% Pref. ...	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	—	23/6	—6d.	5 19 0
do. 7% Pref.	1	6	—	23/-	—	6 1 9
Elec. Supply Corporation ...		10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	12 1/2	—	5 18 10
Lancs. Light and Power ...	1	7 1/2	7 1/2	28/-	—	5 7 1
London Electric	1	10	10	35/-	—6d.	5 14 3
do. do. 6% Pref. ...	5	6	6	5 1/2	+ 1/16	5 6 8
Metropolitan	1	10	11	38/3	—	5 15 0
do. 4½% Pref.	1	4 1/2	4 1/2	17/6	—	5 2 10
Midland Counties	1	5 1/2	6	24/3	—	4 19 0
Newcastle-on-Tyne Ordinary ...	1	6	7	23/3	—6d.	6 0 5
do. 5% Pref. ...	1	5	5	18/9	—	5 6 8
do. 7% Pref. ...	1	7	7	25/6	—	5 9 10
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref. ...	1	6	6	1 1/4	—	5 6 8
St. James' and Pall Mall ...	5	17 1/2	17 1/2	13 3/4	+ 1/4	6 8 8
South London	1	15	15	2 1/4	—	6 0 0
South Metropolitan Pref. ...		7	7	1 1/2	—	5 12 0
Urban Ordinary	1	4	4	18/9xd	—	4 0 0
do. 6% Pref. ...	1	6	6	20/-xd	—	5 17 1
Westminster Ordinary	1	15	15	44/6	—	6 14 10
Whitehall Elec. Invst. 7½% Pref.	1	7 1/2	7 1/2	19/9	—	7 12 0
Yorkshire Elec.	1	8	8	31/-	+6d.	5 3 3

HOME RAILS.

Central London Ord. Assented	Stock	4	4	69	—	5 15 11
Metropolitan	,,	4	5	77	+1	6 9 10
do. District	,,	3 1/2	3 1/2	49 1/2	—	7 4 4
Underground Electric Ordinary	10	Nil	Nil	2 1/2	—	Nil
do. do. "A" ...	1/-	Nil	Nil	8/-	—	Nil
do. do. Income	Bonds	6	6	97	—	*6 3 9

TELEGRAPHS AND TELEPHONES.

		Dividend. 1922.	Dividend. 1923.			
Anglo-Am. Tel. Pref.	Stock	6	6	105	+ 1/2	5 14 6
do. Def.	,,	1 1/2	1 1/2	24	—	6 5 0
Automatic Telephone	1	Nil	3	2 1/2	—	2 16 6
Chili Telephone	5	6	6	5 7/8	—	*5 10 4
Cuba Sub. Ord.	10	7	5	6 15/16xd	— 1/8	7 5 6
Eastern Extension	10	10	10	17 1/2	—	*5 14 3
Eastern Tel. Ord.	Stock	10	10	177 1/2	—	*5 12 8
Globe Tel. and T. Ord.	10	10	10	18	—	*5 11 1
do. do. Pref.	10	6	6	11 1/4	—	5 7 10
Great Northern Tel.	10	24	22	83 1/2	+ 1/2	6 11 4
Indo-European	25	7	7	41 1/2	+2	*4 4 4
Marconi	1	15	10	1 1/16	+ 1/16	5 19 7
Marconi Marine	1	10	10	1 1/4	—	8 17 10
Oriental Telephone Ord. ...	1	12	12	2 1/16	—	*5 16 3
United R. Plate Tel.	5	8	8	7 1/16	—	*5 13 3
Western Telegraph	10	10	10	17 1/2	—	*5 15 11

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	12 1/2	5 1/2	8 1/2	—	8 9 2
do. do. 2nd Pref. ...	5	5 1/2	6	2 9/16	—	10 7 10
do. do. 5% Deb. ...	Stock	5	5	75	—	6 13 4
British Electric Traction Ord. ...	,,	5	6	108 1/2	+1	5 19 10
do. do. 6% Pref. ...	,,	6	6	107 3/8	—	5 11 7
Brazil Traction	100	4	4	58	— 1/2	7 10 11
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	89 1/2	—	5 11 9
do. do. Preferred	,,	5	96/-	89 1/2	—	*5 7 3
do. do. Deferred	,,	8	129/5	107 1/2	—	*6 0 6
do. do. Deb.	,,	4 1/2	4 1/2	78 1/4	—	5 8 3
Lond. & Sub. Trac. 5% Pref. ...	1	5	2 1/2	6/6	—	Nil
London United Tram. Deb. ...	Stock	4	4	47 1/2	—	8 8 5
Mexico Trams, 5% Bonds ...	—	Nil	5	66	—	7 11 6
Mexican Light Common ...	100	Nil	Nil	26	—	Nil
do. Pref.	100	Nil	Nil	61	—	Nil
do. 1st Bonds ...	—	5	5	66 1/2	—	7 10 5
Yorkshire (West Riding) ...	1	—	5	18/9	— 1/16	5 6 8

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	20	12	21	— 1/2	*4 11 5
British Aluminium Ord. ...	1	5	5	92/6	+6d.	3 1 6
British Elec. Transformer Pref.	1	Nil	Nil	17/6	—	... ...
British Insulated Ord.	1	15	15	3 1/16	—	4 17 11
Brush Ord.	1	10	10	25/9	—	6 4 3
Callenders	1	15	15	3 3/4	—	4 9 0
do. 6½% Pref.	1	6 1/2	6 1/2	23/9	—	5 9 5
Crompton Ord.	1	5	Nil	5/8	—	... ...
Edison-Swan	4/-	7 1/2	10	8/-	—	5 0 0
do. 5% Deb.	Stock	5	5	82 1/2	— 1/2	6 1 3
Electric Construction	1	10	10	23/9	—	5 19 10
Enfield Cable, Pref.	1	7 1/2	7 1/2	1 1/2	—	6 0 0
English Electric	1	8	5	17/9	—	5 12 7
do. do. Pref.	1	6	6	21/-	—	5 14 3
Gen. Elec. Pref.	1	6 1/2	6 1/2	23/6	+6d.	5 10 8
do. Ord.	1	5	5	23/9	+9d.	4 4 3
Henley	1	15	15	3 3/4	—	4 14 1
do. 4½% Pref.	5	4 1/2	4 1/2	4 1/2	—	5 6 0
India-Rubber	1	10	5	1 1/2	+ 2/-	*4 8 11
Johnson & Phillips	1	5	10	1 15/16	+ 1/16	5 10 4
Met-Vickers, Ord.	1	12 1/2	8	23/9	—	6 14 9
do. Pref.	2	8	8	2 1/2	—	6 14 9
Siemens Ord.	1	5	—	27/-	—	3 14 0
Telegraph Construction	15	20	20	27	—	*4 14 1

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.	Price May 12.	Fortnight's Inc. or dec.
a Acid, Oxalic ... ... per lb.	5 1/2d.	...
a Ammoniac, Sal ... ... per ton	£60	...
a Ammonia, Muriate (large crystal) ,,	£52	...
a Bisulphide of Carbon ... ... ,,	...	...
a Borax ... ... ,,	£25	...
a Copper Sulphate	£35 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4½d.	...
a ,, Perchlorate ... ... ,,	5½d.	...
a Shellac ... ... per cwt.	£15 15s.	...
a Sulphur, Sublimed Flowers ... ,,	£7 15s.	...
a ,, Roll ... ... ,,	£7 15s.	...
a Soda, Chlorate ... ... per lb.	3 1/2d. to 3 3/4d.	...
a ,, Crystals ... ... per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots ... ... per ton	£120 to £125	...
b ,, Wire ... ... per lb.	1/9 to 2/6*	...
b ,, Sheet ... ... ,,	1/6 to 2/-	...
g Babbitt's Metal and Anti-friction Metal—		...
Grade I ... ... per ton net	£225	£10 inc.
Grade II ... ... ,, ,,	£160	£5 inc.
Grade III ... ... ,, ,,	£90	£1 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	9 3/4d.	...
c ,, Tubes (solid drawn) ... ,,	11 1/2d. to 1/-	...
c ,, Wire, basis ... ... ,,	9 3/4d.	...
c Copper Tubes (solid drawn) ... ,,	1/1	...
c ,, Bars (best selected) ... per ton	£91	...
c ,, Sheet ... ... ,,	£91	...
c ,, Rod ... ... ,,	£91	...
d ,, (Electrolytic) Bars ... ,,	£64 10s.	15s. dec.
d ,, ,, Sheets ... ,,	£143 10s.	...
d ,, ,, Wire Rods ... ,,	£74 10s.	20s. dec.
d ,, ,, H.C. Wire per lb.	9 3/4d.	3/4d. dec.
f Ebonite Rod ... ... ,,	2/- to 8/6	...
f ,, Sheet ... ... ,,	2/- to 8/6	...
a German Silver Wire ... ... ,,	2/8	...
h Gutta-percha, fine ... ... ,,	8/3	9d. inc.
h India-rubber, Para fine ... ... ,,	1/9	9d. inc.
i Iron Pig (Cleveland Warrants) ... per ton.	nom.	...
i ,, Wire, galv. No. 8, P.O. qual. ,,	£23	...
g Lead, English Pig ... ... ,,	£34	15s. dec.
g Mercury ... ... per bot.	£13 15s. - £13 15s.	...
e Mica (in original cases) small ... per lb.	3d. to 3/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ... ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/0 1/2	...
p ,, ,, drawn bars & rods ,,	1/8	...
p ,, ,, rolled strip & sheet ,,	1/9 1/2	...
p ,, ,, wire ... ... ,,	1/9 1/2	...
o Platinum ... ... per oz.	£26	...
d Silicium Bronze Wire ... ... per lb.	1/0 1/2	...
r Steel, Magnet, in bars ... ... ,,	7 1/2d.	...
s Tin, Block (English) ... ... per ton.	£244 to £244 10s.	7s. 6d. dec.
s ,, Wire, Nos. 1 to 16 ... ... per lb.	3/11	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd
m P. Ormiston & Sons.
o Johnson, Mathey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W F Dennis & Co

Coke for Steam Raising.—Under this head the *Gas World* of May 9th says the London County Council has bought 15,000 tons of coke from the South Metropolitan Gas Co. for use at the tramway power station at Greenwich. Our contemporary says: "This departure on the part of the Council is the result of tests on the Greenwich plant organised by the general manager of the South Metropolitan Gas Company in connection with the Council's fuel experiments. The Greenwich power station uses about 200,000 tons of fuel a year, and it occurred to the South Metropolitan Gas Company that, as the gas works is within half a mile of the Council's power station, it would be possible to furnish a regular supply at a minimum cost for transport. The matter was taken up by the general manager, and, after consultation, various improvements were made in the plant at the power station, by which any fuel which proves the most economical can be used—for example, low-grade coal or coke mixed with coal, on the "sandwich" system. . . . The contract placed by the London County Council with the South Metropolitan Gas Company was born of pre-war propaganda, and will cover the period between now and the end of December."

The advantages to be gained by electric power stations consuming coke produced in gas-works, thus avoiding smoke production and obtaining cheap fuel, are obvious; but it is not indicated in the note that the "sandwich" system was in use at the Greenwich power station for many years. Mr. E. W. Dickinson, M.I.E.E., station superintendent, commenced burning coke (alone) at Greenwich power station during the war, in 1917; and in the following year he adopted the sandwich system, with very successful results. The system has also been taken up by several other large undertakings, including the Manchester Corporation at its Barton power station—the most efficient works of its class in the country.

The Conversion of D.C. Three-Wire Networks to A.C.

By D. ROSS.

THE rapid development of the electricity supply industry and the general adoption of three-phase alternating current has created many problems for the mains engineer, one of them being to devise the best method whereby existing d.c. three-wire distribution systems can most efficiently be converted to a.c. systems without any great departure from standard practice and yet be able to utilise existing distributors to their greatest advantage.

Any scheme involving a change-over on large d.c. networks in the industrial and business areas of large towns would undoubtedly be prohibitive. The question, however, could be partially dealt with by giving a supply to large lighting consumers as well as to large power consumers from the high-pressure a.c. mains by means of transformers installed on consumers' premises. It would also be quite feasible to change over a large number of lighting consumers, especially in large blocks of buildings where a transformer sub-station could be installed in the basement or other suitable position, capable of supplying all the consumers in a particular block. Large shops, warehouses, hotels, theatres, schools, &c., could be dealt with in this manner, and thus relieve the load on the d.c. network, incidentally minimising extensions to rotary sub-stations and obviating the laying of new d.c. feeders.

Invariably the question of a change-over in residential and outlying districts is less complicated, and at the same time the results obtained are more beneficial by reducing the losses on long feeders and distributors, and probably avoiding the necessity of providing a new manually operated sub-station, which, with the increasing demand and low voltage at extreme ends of distributors, will eventually become essential on a d.c. system. There are various methods whereby a change-over may be accomplished, viz.:—

(1) Laying an additional single-core cable alongside each existing distributor.
(2) Replacing existing mains with four-core cables.
(3) Using the two outers and the mid-wire for two phases and neutral of a three-phase system.
(4) By using single-phase, three-wire transformers.

1. Laying an additional single-core cable in order to form a three-phase, four-wire system, has little to recommend it, particularly as it is impossible to use armoured cable, and it would therefore be necessary to lay it solid in troughing or else draw it into conduit. Should the system in use, however, be the draw-in system, it would be quite a simple matter to draw in an extra single-core cable alongside of the neutral cable, or preferably to replace the neutral cable with a two-core cable; this would also necessitate slight alterations to the service boxes and the changing-over of every third consumer on to the new cable. Any advantages to be gained by this method, except where the draw-in system is employed, would be entirely outweighed by the heavy expense that would be incurred in opening and reinstating roads.

2. The question of replacing existing mains with four-core cables will depend to a considerable extent on the condition of the mains and whether the increasing demand and the possible development of the district will warrant the heavy expenditure.

3. This method may be adopted especially where it is desired to use a standard three-phase transformer in order to reduce to a minimum the stocking of spare transformers of different types, and where it is desired to avoid reopening of streets to relay mains. It will be necessary to split up the network at some suitable intersecting point into three sections and balance each section across two phases and neutral of a three-phase transformer. Where transformer kiosks are favoured, the cost of a change-over is comparatively small, the main items being h.p. pillar, transformer kiosk, l.p. distributor panel, and the changing of consumers' meters; consequently a very quick change-over can readily be made, as consumers' services do not require altering in any way. When it is decided to change-over—the transformer kiosk, &c., having previously been connected up and the inter-connecting cables laid to the point where it has been decided to cut—all that is required is to isolate the district to be changed over from the rest of the network and join through cables from transformer to existing distributors. Needless to say, it will also be necessary to disconnect or change all d.c. meters in this area before restoring the supply.

Unfortunately, the disadvantage of this arrangement is that the section of the neutral conductor governs the current-carrying capacity of the outers, as the current in the neutral is obviously more than out-of-balance current; it is, in fact, the resultant of the currents in the two outers which may be of the same value as the current in any one of the outers. By interconnecting the neutrals at extreme ends of the different sections, these effects may be reduced, but owing to the scattered condition of distributors in residential districts, this result may rarely be obtained.

4. In the opinion of the writer this is the most economical method of dealing with a change-over, as the current-carrying capacity of the distributors will be very little less than with d.c. where multicore cables are in use. Instead, by cutting the network into sections, existing distributors will be capable of dealing with a much larger load owing to their being shorter and the voltage drop less. There are two arrangements open to the mains engineer, and local conditions will assist in deciding which one to adopt.

(*a*) One sub-station with three single-phase, three-wire transformers, each connected across different phases of the high-pressure mains, each transformer to supply a separate area, the load of which should be arranged to be as near equal as possible; short feeders to be run from each l.p. control panel to the centres of gravity of each area.

(*b*) Three separate sub-stations or transformer kiosks, each one of which should be placed as near as possible to the centres of gravity of three separate areas. The high-pressure main to be looped into each sub-station and the single-phase, three-wire transformers balanced across different phases; distributors to be connected straight on to l.p. distributor panel. If desired, the high-pressure main could be completed to form a ring-main.

This article would be incomplete without some reference to the effects of eddy currents on the lead sheaths of single-core cables, as the adoption of a change-over scheme may rest entirely on this question. It will therefore be necessary to consider the cause and effect of eddy currents and the best method of reducing them to a minimum.

Eddy currents vary according to the following conditions:—(*a*) Current in conductor; (*b*) length of conductor; (*c*) spacing of conductors; (*d*) section of lead sheath.

(*a*) Eddy currents induced in the lead sheath of a single-core cable vary proportionally to the current in the conductor.

(*b*) An increase in the length of cable will result in an increase of eddy currents, but owing to the self-induction of the eddy currents, this increase will not be in direct proportion to the length of the conductor.

(*c*) As the field of the current in one conductor will neutralise the effect of the field of the current in the conductor running parallel with it, a reduction in the spacing between the cables will also reduce the value of the eddy currents induced in the lead sheaths; consequently on a three-wire system the neutral sheath will only be affected by out-of-balance currents, which for all practical purposes are negligible.

(*d*) Obviously, eddy currents will increase with an increase in the section of the lead, but as this factor is unalterable and any advantage to be gained so very slight, there is no justification in considering the matter further.

It will therefore be recognised that, owing to the resistance offered to the e.m.f.'s induced in lead sheaths being so little, the eddy currents may attain a considerable value on a long length of distributor should the lead sheaths form a closed circuit by being bonded at extreme ends, thereby resulting in undue heating and increased losses. These effects can be reduced considerably by keeping the lead-sheath circuit open by bonding and earthing at one end only; where the lead sheaths have to be cut for the purpose of connecting services to mains, the lead sheaths should be bonded continuously and not across as customary, the service box being earthed to the neutral sheath.

Where a large number of services are already connected to a long distributor, and it is not desired to open up service boxes to rearrange the bonding, it will be permissible to allow boxes to remain unaltered, provided the distance between them does not exceed 25 yards, the load on the distributor is not more than 100 amperes, and the spacing between conductors is less than six inches; with these conditions there will be no heating of the lead sheath, and the eddy-current loss will not exceed 2 per cent. of the c^2R loss.

To give the subject of induced and eddy currents in cable sheaths the theoretical treatment it really deserves would require a separate article. It has been the writer's endeavour to deal with it in a practical manner only so far as a change-over scheme may be concerned.

The G.E.C. Electric Home.

THE GENERAL ELECTRIC CO., LTD., has recently opened at its Kingsway premises an "electric home," and representatives of the Press were invited to inspect this recently.

The "home" consists of eight rooms arranged on the lower ground floor of the company's showrooms. These represent a lounge hall, drawing room, dining room, bedroom, bathroom, scullery, kitchen and power house, and each of them is provided with full electrical equipment of the highest quality, particular attention having been devoted to appropriate illumination.

The entrance hall gives an initial impression of warmth and well-being. It has a Jacobean air to which a "Magnet" fire situated in an open hearth contributes. The main illumination is carried out by a central antique brass fitting; this is supplemented by a table lamp, a floor standard and candle brackets. Among the smaller refinements are a cigar lighter and a ringing letter-box.

Fig. 1.—The Dining Room.

Following the accepted rule, the dining-room (fig. 1) is panelled with dark oak and the lighting is of a subdued nature. An oak ring bearing four candle fittings is the principal source of light, while local illumination is provided by candlesticks, a floor standard and a table standard distributed about the room. The floor standard is provided with a "Partridge" reflector, which gives direct and indirect illumination, separately or combined as desired. The heating is carried out by means of a "Magnet" fire, which is in keeping with the decorations, and a low-wattage screen. On the sideboard are examples of small table appliances—a coffee percolator, tea kettle, toaster, &c. An "Express" service lift provides communication with the kitchen, and a "Freezor" fan aids ventilation. Probably the best thing about the dining-room, however, is the view from the window. An artificial lawn with flower beds and an artistic background has been arranged, and by means of concealed "Osram" lamps fitted with special colour filters a remarkably striking imitation of sunlight floods the scene, or, if desired, a "moonlight" effect can be substituted.

The drawing-room is decorated in an Oriental manner—black and gold being the dominating colours. The central lighting fitting has a beautifully hand-painted silk shade, and around the walls are bracket lights with shades of a similar design. Coloured as well as "white" light is available. Another illuminating agent is a black and gold lacquer floor standard. A black and gold "Magnet" fire is placed in the hearth and a similarly-decorated radio cabinet stands in a corner of the room. From this set invisible wires are run to every other room in the "house," and these terminate in wall sockets to which headphones can be connected. One side of the room consists of glass doors covered with yellow-gold curtains, and by means of well-arranged concealed lamps a sunlight effect is obtained in the room with a small expenditure of energy.

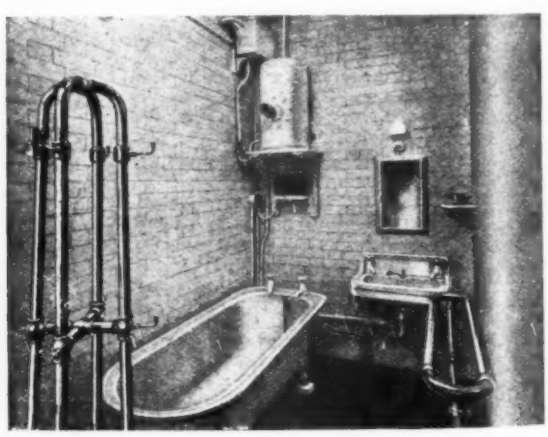

Fig. 2.—The Bathroom.

The bedroom is furnished in grey satinwood, and the walls are also of a soft grey colour. The appliances shown include a curling-tong heater, an "Osglim" bedside lamp, an electric kettle, and a "Magnet" fire—with a grey finish in accordance with the general scheme. In the centre of the ceiling is an alabaster bowl, fitted with a "White Osram" lamp, which gives soft diffused illumination. Over the dressing table is a two-light adjustable oxidised silver fitting, and a floor standard with a "Partridge" shade also provides local illumination. Another feature of the room is an intercommunication telephone which harmonises with the decorations.

The bathroom (fig. 2) is exceedingly well equipped. The hot-water supply comes from an electric "calorifier" of large capacity, the heating elements of which are controlled by a thermostatic device. A towel rail and bath-gown stand, heated by immersion units and nickel plated are exhibited. A white enamelled "Magnet" fire, an electrically-heated mirror, a

shaving pot, and an electric hair dryer are also provided. The main illumination comes from a "Superlux" diffusing globe, and there is also a lamp fitting above the mirror.

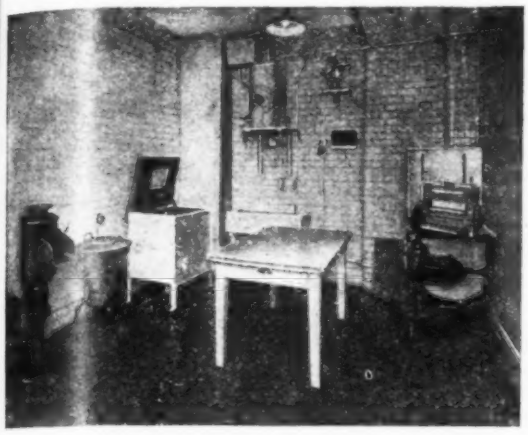

Fig. 3. The Scullery.

The kitchen is equipped with two sizes of "Magnet" cooker, an electric hot cupboard, a water boiler, and a number of smaller cooking appliances. Here, also, are an electrically-driven sewing machine, irons, and the "Express" service lift mentioned above. The room has an air of perfect cleanliness, being decorated in white, with dustproof diffusing globes to provide the necessary light.

In the scullery (fig. 3) is a "calorifier" similar to that in the bathroom. The washing of clothes is provided for by a 10-gallon boiler, and a "Thistle" rotary-cylinder washing machine and wringer. An electric dish-washer which scours and dries crockery very efficiently is another part of the equipment, and among the other labour-saving devices is an electric potato peeler.

The general illumination of the scullery is effected by two "White Osram" lamps in concentrating reflectors. Over the sink is an auxiliary bracket bearing another "White Osram" lamp in a simple opal shade. The wiring, and that in the kitchen, is carried out by means of the "Magnet" system, which is simple and unobtrusive.

The "generating station" houses a small self-contained lighting set, consisting of a single-cylinder petrol-paraffin engine, a "Witton" generator, and a switchboard mounted on the frame of the latter. A suitable accumulator has also been installed.

This "electric home" can truthfully be described as one of the best examples arranged so far. Everything possible seems to have been included, and the show demonstrates in an effective manner the many uses of electricity and the wide scope of the General Electric Co.'s activities.

After inspecting the "house," the visitors watched a demonstration of shop-window lighting to prove that with a comparatively small outlay an excellent means of "publicity" is available in the window of a closed shop.

The visit terminated in a tour of the expansive showrooms at "Magnet House."

The Institution of Electrical Engineers.

Annual Report and Accounts.

THE annual general meeting of the Institution took place on May 7th, when the president (Mr. W. B. Woodhouse), in introducing the Council's report, drew attention to the continued growth of membership. During the year under review (April 1st, 1924, to March 31st, 1925) 879 new members raised the total to 11,743, a net increase of 328 after allowing for losses. Regarding the designation "Chartered Electrical Engineer," the Council relied upon the support of members in preserving the strict use of a title which carried with it an honourable distinction.

The report is summarised below:—

It recently came to the knowledge of Mr. J. Orchiston, local hon. secretary and treasurer of the Institution for New Zealand, that a person in that Dominion was falsely representing himself as being a member of the Institution and using the letters A.M.I.E.E. Legal proceedings having been taken, a conviction was secured and the offender was fined £5.

The attention of the Council was recently drawn to an advertisement of a local authority in which chartered electrical engineers were invited to submit, in competition with each other, their terms for professional advisory work. Such a proceeding is undesirable and not in the best interests of local authorities requiring advice. The Council would consider it to be a breach of professional etiquette for a member of the Institution to reply to such an advertisement. Where the names of a sufficient number of consultants are not known, the president of the Institution will always be willing to submit the names of qualified engineers for the purpose.

During the year Sir Oliver Lodge, D.Sc., F.R.S., was elected an honorary member; Mr. B. Longbottom, member of Council, received a knighthood, Capt. J. K. im Thurn was made a C.M.G., and Sir J. J. Thomson, M.A., O.M., F.R.S., was awarded the Faraday Medal; 68 members of all classes died during the year.

To remove misapprehension the Council includes in the report an outline of the procedure followed in connection with papers: The final decision with regard to the acceptance or rejection of a paper lies in the hands of the Papers Committee, which consists of the eight chairmen of the local centres and seven other members of Council. Each paper received is submitted to two or more referees, and care is taken in selecting the referees that they are in a position to consider the subject matter of any particular paper from the point of view of the general body of members rather than from a highly specialised aspect. The referees do not see each other's reports, but their reports, together with the paper, are submitted to a member of the Papers Committee, who at the beginning of the session is selected to be the Committee Referee for all papers falling under the particular subject allotted to him: he reports to the Papers Committee, which comes to a final decision after consideration of all the reports.

As regards the obtaining of papers, the Papers Committee is in close collaboration with the committees of the local centres and the five sectional committees of the Institution. The selection of papers for the Wireless Section is in the hands of the Wireless Section Committee. The Council expresses its thanks to the chairman of local centres for their regular attendance at the meetings of the Papers Committee, thereby ensuring efficient contact and co-operation between the Committee itself and the committees of the local centres in the important question of papers. The Council will be pleased to consider any constructive suggestions for the improvement of the papers.

During the past twelve months, 365 meetings have been held in London and the local centres by members the Council, and the various Committees.

At the Centres and Sub-Centres the attendance at the meetings and the interest in the discussions have been well sustained. The President attended functions at eight Centres and two Sub-Centres, and was gratified to note evidence of continued development. The Wireless Section held seven meetings at which nine papers were read. Fourteen informal meetings have been held during the session and the average attendance was 59, an increase of nine over last year. There are at present 3,841 students on the register and the eight Students' Sections have carried out a very full programme of meetings, visits to works, and social functions.

With a view to increasing the interest of the general public in electrical matters, the Council instituted in 1923 the Faraday Lectures, which are delivered at selected local centres, and are open to the public by means of admission cards obtainable through members of the Institution. The first five lectures were delivered during the Session under review by Prof. G. W. O. Howe, D.Sc., at Birmingham, Edinburgh, Leeds, Manchester and Newcastle, his subject being "World-Wide Radio Telegraphy."

A David Hughes scholarship was awarded to Mr. H. E. W. Tumath (Municipal College of Technology, Belfast) and a Salomons scholarship to Mr. E. Youel (Liverpool University), while from the War Thanksgiving Education and Research Fund (No. 1), a grant of £100 for educational purposes has been made to Mr. A. E. Morrill (City and Guilds (Engineering) College, London).

The Council has appointed a Committee to ensure representation of British interests at the Paris International Conference on large e.h.p. electricity supply systems, which will take place in June, 1925. The following papers are to be presented:—

Title of Paper.	*Author.*
H. W. CLOTHIER	Metal-clad Switchgear and Isolation of Faults.
A. R. EVEREST	Insulating Oils: A Review of Research Work in Great Britain.
R. W. GREGORY	British Practice in Sub-station Design, dealing with the use of Metal-clad Switchgear.
J. L. LANGTON	Developments in Porcelain Line Insulators.
R. B. MATTHEWS	Rural E.H.T. Distribution.
A. PAGE	The Re-organisation of Electricity Supply in Great Britain as governed by the Electricity Commission.
G. V. TWISS	Consideration of Assumed Loadings in their relation to Safety of Overhead Lines.

The following British delegates have been appointed, and others may be appointed later:—Messrs. W. B. Woodhouse (chief delegate), A. R. Everest, P. V. Hunter, C.B.E., A. Page, and E. B. Wedmore.

Being of opinion that some of the provisions of the Wireless Telegraphy and Signalling Bill, unless modified, will prove a hindrance to radio science and the progress of electrical science generally, the Council made representations to the Postmaster-General with regard to some of the clauses. The matter is still under consideration.

During the year 295 books and pamphlets were presented to the reference library and 226 volumes have been purchased. A slight decrease in attendance is recorded, the total number for the year being 2,419, of whom 108 were non-members, as against the total of 2,526 in 1923-1924. The Council records the continued circulation of books from the lending library, to which 89 new volumes have been added during the year; 2,184 were issued to 872 borrowers, the corresponding numbers for the previous year being 2,232 and 897 respectively. A new edition of the lending library catalogue with a subject guide to authors is in preparation.

The number of applicants for posts registered by the Electrical Appointments Board on March 31st, 1925, was 78, against a total of 114 last year. The Council earnestly hopes that members who are in a position to assist will not fail to make use of the register.

The net cost of printing and posting the *Journal* in 1924, after allowing for sales and the revenue received from advertisements, was £3,078, as compared with £4,159 in 1923. The net cost per page works out at £3.06, as against £3.45 for 1923, in spite of the fact that the number of copies printed increased from 11,400 in 1923 to 12,000 in 1924. The reduction in the cost is mainly due to the increase in the advertisement revenue, only nine months' revenue from this source having been included in the 1923 accounts. Regarding *Science Abstracts*, the net cost of the publication to the Institution in 1924 was only £68, which the Council considers satisfactory.

The revised edition (8th) of the Wiring Rules, now published under the title of "Regulations for the Electrical Equipment of Buildings," was issued during the summer of 1924. The Committee is considering the desirability of recommending the Council to amend the wording of a number of the regulations with a view to removing misunderstandings and taking into account the points and principles which have been raised. Concerning the Electricity Commissioners' Regulations (*a*) for securing the safety of the public, and (*b*) for ensuring a proper and sufficient supply of electrical energy, it is hoped that a report thereon will be ready for submission by the Council to the Commissioners at an early date. The report of the Committee on Electricity in Agriculture is nearly ready.

For the final examinations of 1924 the joint standing committee representing the Board of Education and the Institution approved 53 courses at schools and colleges for the award of national ordinary certificates in electrical engineering, 15 for the award of higher certificates, 4 for the award of ordinary diplomas, and 2 for the award of higher diplomas. The numbers awarded were as follows:—282 ordinary certificates (including 103 distinctions); 43 higher certificates (including 14 distinctions); 9 ordinary diplomas (including 22 distinctions); and 5 higher diplomas (including 3 distinctions).

The Institution's Benevolent Fund capital account stands at £9,969, and the accumulated income at £1,889. The donations and subscriptions to the fund in 1924 amounted to £1,152, and 78 grants were made to 26 persons, amounting to a total of £1,322.

After making provision for contingencies there is a margin to the good on the revenue account of the Institution for 1924 of £2,925, which has been carried to the credit of the general fund, comparing with £3,957 in 1923. The decrease was chiefly due to the reduction in subscriptions, which came into operation on January 1st, 1924. The assets amount to £139,485.

Mr. A. H. Allen, in seconding the motion, remarked that the report indicated the flourishing condition of the Institution; nevertheless, with nearly 12,000 members, the scarcity of papers during the session was noticeable. That should be one of the most important points for the Council's consideration. A lesson could be learned from the informal meetings. He doubted whether the importance of the Paris E.H.P. Conference was fully appreciated. The Proceedings of that Conference would be printed in English if sufficient applications for copies were received, but so far the demand had not justified such publication.

Mr. F. Purse remarked that the membership was not so satisfactory as might be expected; the number of students was large, but many of them allowed their membership to lapse for one reason or another. An analysis of the various classes indicated that the senior members were steadily dropping behind.

Mr. D. G. Hurlbatt also took part in the discussion and addressed a number of questions to the president.

Another speaker drew attention to the clause in the charter which prevented certain foreigners becoming members of the Institution, and asked whether the Council could ascertain the views of the members on that point.

Mr. Baker supported Mr. Allen's remarks concerning the papers, and pointed out that much more useful discussion was forthcoming at the informal meetings. The disadvantage of the Paris Conference publications was that one had to purchase all or nothing. If individual papers or sections of the proceedings could be obtained separately, more of them might be sold.

The President said that the Council would give consideration to the various suggestions that had been made, and the report was adopted.

The Hon. Treasurer submitted a statement of accounts, remarking that he was satisfied with the prospects, but pointed out that the re-wiring of the Institution building would have to be undertaken during the current year, and it was also possible that the rating of their property would be increased this year.

Mr. Kingsbury seconded the motion, and after a few questions the accounts were adopted.

Mr. Ll. B. Atkinson proposed a vote of thanks to officers and honorary officers at home and abroad, which was passed.

The re-appointing of the auditors concluded the business of the meeting.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

The "G.E.C." Grip Terminal.

A novel form of spade terminal has been put on the market by the General Electric Co., which eliminates a great deal of the trouble ordinarily associated with this type of

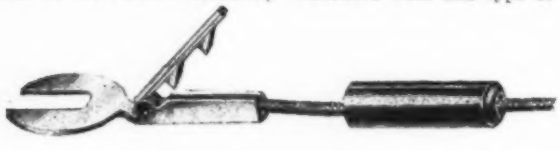

Fig. 1.—Grip Terminal, open.

Fig. 2.—The "G.E.C." Grip Terminal, closed.

terminal. As will be seen from the illustration (figs. 1 and 2), it consists of a channel with a spade end into which a toothed bar fits, efficiently gripping the wire. The insulating sleeve, which is coloured red or black, is then slipped over to keep the bar down.

The B.T.-H. Type "R" Valve.

In the early days of radio-telephony the B.T.-H. type "R" valve achieved a remarkable reputation. Since then, however, the qualities of the bright emitter have been, perhaps, rather over-shadowed by the development of the various dull-emitter valves, but the British Thomson-Houston Co., Ltd., has maintained constant research with a view to the improvement of the bright-emitter valve. No sensational changes have been made, and the electrical characteristics of the present "R" valve (that is, the filament and plate current and voltage) are as they have always been, but refinements have been made in manufacture. Besides the method of exhausting by incorporating a "getter," an important feature is the definite reduction in grid current. The exhausting process has, it is claimed, actually increased the emission from a given filament and, incidentally, obviated the need for undue over-running during the course of manufacture, which has resulted in the steepening of the grid-current characteristic curve. Some valves have a higher grid current at zero grid voltage than formerly, and in many cases, therefore, biasing the grid has become of great importance. Current flowing in the grid circuit impairs the amplifying function of the valve, and the company therefore considers it essential to keep this grid current down to a minimum. This has been successfully accomplished in the later type "R" valves, with the result that they will function well even if means for giving the grid its most suitable bias are not available.

A further improvement is the low anode current: At zero grid voltage it is about 1.5 milliamps with 60 volts h.p., which

reduces the drain on the h.p. battery. The characteristic curve, fig. 3, has a steep slope (0.28 milliamp. per volt when using 60 volts h.p.). The rating of the "R" valve filament is 4 volts at 0.7 amp., while the total emission is 5 mA; anode

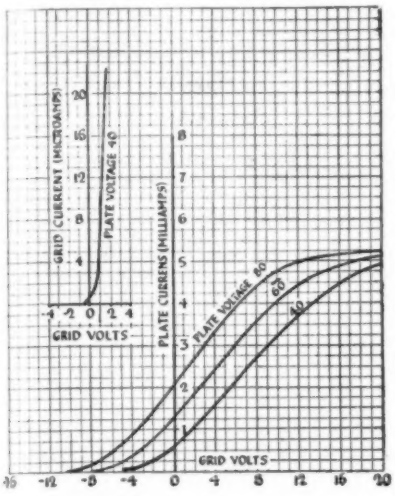

Fig. 3.—B.T.-H. Type "R" Valve Characteristic.

current at zero grid voltage 1.2 mA; voltage amplification factor 7.5; and anode resistance 27,000. These valves are now being made without tips, the rating being marked on the end of the bulb.

A New Dual Rheostat.

We have had a sample of a new dual rheostat that Messrs. Radio Instruments, Ltd., have just put on the market, which has been specially designed for use with either dull-emitter or bright valves. It is provided with a graduated scale and an "off" position, so that there is a distinct indication, both visual and by touch, when the slider is out of contact with the two resistance units, thereby avoiding the possibility of switching on to the coarse resistance when a dull-emitter valve is in use. The component is well-made; it needs one hole only for fixing, and can be mounted on any panel by anyone of average intelligence within two or three minutes.

The R.I. dual rheostat comprises two coils of enamelled resistance wire, which is unaffected by temperature variation, wound on two cylinders of hard insulating material having a larger carrying area than that usually employed. One coil has a resistance of 5 ohms for bright valves, and the other of 30 ohms for dull-emitter valves; both coils are clamped in a solid brass frame, the ends of the resistance windings being led to convenient milled-headed terminals. The most important features of the design is the spindle contact brush which is provided with a specially-shaped clamping bush having a large bearing surface. The tightest clamping will not alter the smooth brush pressure.

A Geared Square-law Condenser.

We have received particulars of a square-law condenser from the Sterling Telephone & Electric Co., Ltd., which is so designed that the motion of the control knob is communicated to the movable vanes by 6 to 1 reduction gearing. To turn the vanes from the position of minimum to that of maximum

Fig. 4.—Sterling Geared Condenser.

capacity, three complete turns of the control knob are necessary, and it is, therefore, invaluable for accurate tuning, since a fine adjustment is available at all parts of the scale. The indicator dial is rigidly fixed to the moving vanes, and thus marks their actual movement; there is no backlash in turning the control knob. The Sterling geared condenser is made in three capacities, as follows:—0.00025 mfd, 0.0005 mfd, and 0.001 mfd.

A New Variable Transformer.

A new intervalve transformer that has been placed upon the market by Ena Electrical Appliances, Ltd., is unusual in that it has been designed so that the operator can select the winding most suitable for his set and working conditions. Three secondary terminals are fitted, as indicated in fig. 5, giving

Fig. 5.—The "Ena" Variable Transformer.

a choice of three e.m.f. values. The primary and secondary ratios are 1-2, 1-3, 1-5, and in the reverse ratio if used as a step-down transformer. Where the transformer has to be fitted in an inaccessible position, a special switch can be supplied to facilitate the change-over from one ratio to another.

"M.H." Reactors and Dampers.

To-day (May 15th) Messrs. L. McMichael, Ltd., are placing two new products on the market in the form of accessories to their h.f. transformer—namely, a "reactor" and a "damper." The former is an attachment that enables reaction to be applied to the receiving set, whilst at the same time eliminating, it is claimed, the disadvantage of interference with nearby listeners. The reactor is also applicable to super-heterodyne circuits, providing an oscillator for coupling to the detector and adding to the ease of control and receptive ability.

The control of oscillation when using h.f. amplification being sometimes difficult, has led to the introduction of a "damper" or stabiliser which, when used in conjunction with McMichael transformers, reduces the difficulty and renders such control simple and reliable, and at a very small cost. The device operates in the central hole in "M.H." transformers. Messrs. McMichael inform us that they have for some time been following a progressive line of research into super-heterodyne operation, and hope to be able to make an interesting announcement shortly.

An Interchangeable Bobbin Rheostat.

In view of the variety of valves now available, and the consequent necessity of varying the range of the filament rheostat, the Radio Communication Co., Ltd., has brought out a neat device which enables this to be done with ease. The holder is a fixture, with two spring contacts; the resistance consists of a bobbin which can be slid into place and clamped with a nut. In the "off" position the springs are automatically lifted clear of the bobbin, thus opening the circuit, and at the same time

Fig. 6.—"Polar" Bobbin Rheostat.

leaving the bobbin free for removal. Provision is made to ensure that the bobbin is registered in the correct position, and the terminals are readily accessible. These features are shown in fig. 6, with the bobbin about to be slid into place. Five bobbins are standardised, with ranges of from 5 to 40 ohms; in the high-range patterns a proportion of fixed resistance is included. A sample which we have used works smoothly and has proved very useful.

The Design of Controllers for Electrical Winders and Haulages.

By ALLEN WEST.

(*Abstract of Paper read before the* LONDON BRANCH *of the* ASSOCIATION OF MINING ELECTRICAL ENGINEERS.)

THE paper deals with control gear for winders where the drum is driven direct or through gearing by a three-phase induction motor. For these winders, liquid controllers with either air-break or oil-immersed stator reversing switches have become standard practice, although in America a certain number of contactor controllers are still used.

An alternative to the contactor and liquid types of controller is the oil-immersed drum controller which as a rule is only used with haulages, and underground. The advantage which it has over contactor gear is the fact that it can be used equally as well below or above ground. The drawbacks which it has are the same as those which apply to contactor gear except that it is a simpler piece of apparatus and consequently less liable to get out of order. On the other hand it has the disadvantage of dangers of breakdown of insulation under the oil due to carbonisation, and of internal explosion due to arcing under the oil. These dangers can, of course, be minimised by providing very large creep distances between adjacent live parts, but the consumption of oil is usually a considerable item and makes the maintenance costs very heavy as compared with the liquid controller, which should have practically no maintenance costs.

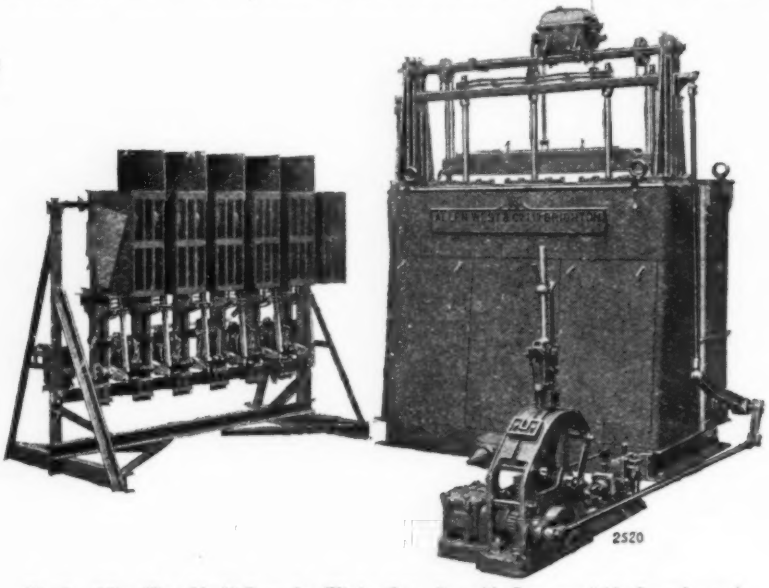

Fig. 1.—Allen West Liquid Reversing Winder Controller with Compressed-Air Operation and Contactor Stator Reverser.

Liquid rotor controllers consist of two types, the weir type and the moving electrode type, both of which can be semi-automatic, so that the speed of acceleration is taken out of the driver's hands; the weir type controller is obsolete.

With the moving-electrode type of controller, subject only to the limitations of the three-phase induction motor, ideal control can be obtained and small winder controllers can now be operated quite easily with standard hand levers subject to the system of bell cranks and shafts being correctly designed and erected. Most cases of stiff operation will be found to be due to carelessness in erection.

Larger controllers require auxiliary power to assist the driver.

Fig. 1 shows a liquid reversing winder controller with compressed air assisted lever operating gear and h.p. air-break contactor stator reverser.

Fig. 2 shows a controller suitable for a 1,500-2,000 normal h.p. winder with pump circulation of the electrolyte.

The object of pump circulation is primarily to ensure freedom from internal arcing between the electrodes if the electrodes are brought too near together before the motor starts.

If under these conditions the electrolyte is stagnant or flowing only sluggishly, an arc may form which will destroy the electrodes and the insulating chambers. This danger can be further minimised by the use of a controller with as long a stroke as possible, so that a strong solution of electrolyte can be used. The motor will then have a better chance of starting with the electrodes some distance apart, and, with a long stroke, satisfactory reverse current braking can be obtained even with a strong solution.

A controller is sometimes required to pass 5,000 A for starting under exceptional conditions of low line voltage and maximum load. To enable this to be done safely, 1,000 gallons of electrolyte per minute are pumped through the electrodes.

Fig. 3 shows a controller designed to meet these conditions; it is capable of dealing normally with 14,000 h.p. when fitted with the pumped electrolyte system.

Either an adjustable mechanical or hydraulic retarder is used to fix the minimum time of cutting out rotor resistances.

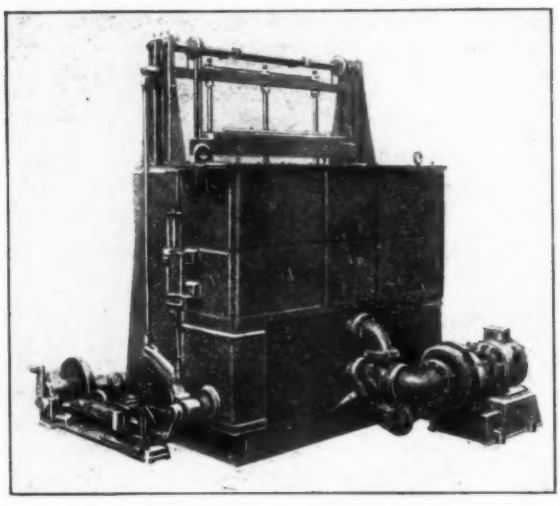

Fig. 2.—Allen West Controller for 1,500-2,000-h.p. Winder, with Pump Circulation.

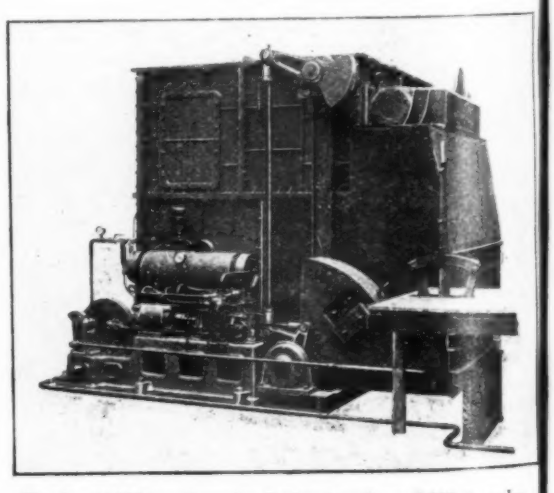

Fig. 3.—14,000-h.p. Controller Designed to Carry 5,000 A under Exceptional Starting Conditions.

Creeping speeds with varying loads are obtained by a long stroke combined with an efficient cooling system.

Reverse current braking is quickly applied up to two-thirds of the total resistance and then the remainder can only be cut out more gradually. Negligible slip is obtained by the use of large electrode area and by keeping that area clean by efficient circulation. Destructive arcing is avoided by flushing the electrodes with pumped electrolyte.

The material for the insulating pots supporting the fixed electrodes has received a great deal of attention. Glazed earthenware has been most generally used; it is renewable and in proportion to the number of controllers in use few breakages take place.

Wooden pots are now also largely used, and if properly constructed, are very durable and give no trouble. Their drawback is that they must be stored wet or they tend to leak when first put into use.

Insulated steel pots have also recently been tried and it is understood that the problem of maintaining the insulation under the electrolyte has been solved. Their use must, however, be limited to small horse power motors if reverse current braking is to be used, especially on circuits of 40 or 50 periods, because of the danger of overheating on what amounts to a closed circuit transformer. It was found that a metal tube ¼ in. wide over an insulating pot became red hot in about two seconds on reverse current braking (100 cycles) on a winder motor of 800 h.p. of the Victoria Falls Power Supply Co.

Porcelain or glazed earthenware pots which cracked on the average every three or four months through arcing when starting against overloads, with a weak soda solution, have worked without further breakages or failure of any kind since the introduction of the forced pump circulation of electrolyte.

Experience has led cast iron to be most generally used for electrodes and if slip is to be avoided they must be of ample area.

There is no doubt that throughout the country, there are many winders and haulages running with heavy avoidable slip due to the controller, which could be eliminated if makers were consulted. In some cases the losses due to avoidable slip are equal to all the other rheostatic losses incurred in the controller. The author saw recently a winder at the Mines d'Anzin, in France, where the full speed was increased 15 per cent. without additional current consumption by installing a controller with up-to-date electrodes. It is interesting to note that at this mine the maintenance is so carefully organised that the loss of weight of all electrodes is measured and recorded every three months.

Drum type reversers give absolutely satisfactory service on winders up to 100 h.p., and haulages up to 200 h.p., and are quite easy to operate.

Hand-operated switches, with quick make and break, for medium powers, are much the least expensive reversers to maintain, and their oil-consumption is not more than 25 per cent. of that of an oil-immersed contactor. Against this, they are heavier to operate if operated through a small angle. The author's view is that if operated through a larger angle, when they can be operated quite easily, they are the most reliable oil-immersed reversers for any mining service. A small angular operating movement has always been considered necessary in order to leave a large movement for the rotor, but I am confident that this difficulty can be got over, and one of the largest 3-phase winders on the Rand in South Africa is now being fitted with hand-operating gear of this type.

Oil-immersed contactors are usually magnetic and are easy to operate, but like the hand-operated contactors they have their drawbacks. To get a switch of anything like the same reliability and life, they are far more expensive, and the attempt to make cheap models is fraught with a good deal of risk and high maintenance costs.

For voltages up to 650, ordinary heavy steelworks air-type break reversing contactors are satisfactory and reasonable in cost.

For anything above 700 h.p., and probably above 500 h.p., and pressures above 2,000 V horn-break contactors are without doubt the most reliable, they require very little attention and the maintenance cost is negligible. The first cost, however, is considerably higher than that of any other type of reversing switch.

Controllers are usually drum type for small reversing haulages, and oil-immersed or liquid for medium or large haulages. Liquid controllers for haulages are of similar design to winder controllers, although, since they do not require as quick reversal, it is usual to operate them with a gate-change instead of a straight-through lever gear. They do not, as a rule, require an auxiliary air-engine to assist the driver, and they are seldom fitted with an accelerating governor. The cooling water required for creeping speeds is sometimes a difficulty; they are often cooled by thermo-siphon circulation of the cooling water through a series of small open tanks or colliery tubs where no cooling water is readily available.

To sum up, for haulages as well as for winders the use of liquid controllers seems likely to become standard practice except for very small sizes.

Discussion.

THE Branch President (MR. J. W. GIBSON), in opening the discussion, said it was very seldom that they had the opportunity of witnessing a full-size demonstration in the subject which was dealt with in a paper read before the Branch, and the opportunity they had had that afternoon of seeing the actual apparatus made the paper very much more interesting and instructive.

MR. E. KILBURN SCOTT said he would like to know what was the permanent leak through the 2,500-h.p. controller which they had seen in the works. There must be a permanent leak right through to earth. At one end of the liquid circuit there was a 2,000-V pressure, but the drop of pressure through the liquid must be very rapid directly it left the actual electrolytic contacts. He was interested in this, because there were certain furnaces in which the electrodes had to be cooled by water being passed through them. The water was pure, and the furnaces were worked at 5,000-V, and large glass tubes were put in which were sufficient to prevent any big leak. He would also like to know if there was any electrolysis in the piece of apparatus he had already referred to. He was astonished to hear from the author that the air-break switch was better than the oil-break switch.

MR. H. M. MORGAN said, in a paper read at the World Power Conference at Wembley Exhibition last year—and to be read again in the near future before the Institution of Mining and Metallurgy—Mr. Vaughan dealt with the problem of three-phase *versus* Ward-Leonard winders, and stated that the three-phase winder was lower in first cost probably by 25 per cent. than the Ward-Leonard system, and that it had a higher efficiency. The disadvantages were that more labour was required to control it; that it was not regenerative, and consumed power in lowering loads and braking.

MR. A. JOHNSON referred to Mr. West's statement that the proper thing to install was the air-break contactor and to the impression so many people were under that oil-immersed gear should be used. He asked whether Mr. West was alluding particularly to mining work and if the air-break contactor held for industrial problems generally to the same extent that it did for colliery or winding propositions.

MR. WEST, in reply, said with reference to the resistance of the controller, the slip-ring terminals must be capable of withstanding 2 or 2½ times the standstill rotor pressure of the motor, because, as the motor was reversible, there should be more than the full rotor volts and therefore the insulation must have a margin, especially as the switches were liable to be damp if there was any creepage of the electrolyte. Consequently, all lift controllers were designed with plenty of margin from the insulation point of view. As to whether electrolysis took place, somtimes a rectifier action occurred in a controller under certain chemical conditions on the electrodes, and in that case there was a certain amount of electrolysis and a very large slip. If the slip in a controller suddenly went up, it was due to old-fashioned material in the electrodes, combined with rectifier action, which might cause the slip to be as much as 15 per cent. With regard to air-break controllers, what he had said related primarily to very frequently-operated switches, such as reversing or rotor switches. His firm was making a 40,000-volt air-break switch for the Victoria Falls Power Co., because that company had had trouble from burn-outs with oil switches. The opinion given by Mr. Vaughan—mentioned by Mr. Morgan—was an unbiased one. The large controller which they had seen cost about £500 or £600 more than the motor, which cost £2,400. He did not mind admitting that the firm had lost a good deal of money over that particular controller, but it had resulted in the accumulation of valuable technical knowledge, and it was satisfactory to know that some of the biggest motor makers on the Continent had standardised on this type of controller, and orders from the Continent were partly the result of the advertisement from these large specialised jobs.

The BRANCH PRESIDENT, in proposing a hearty vote of thanks to the author, said that pump circulation was going to get over a good many of the inherent troubles of switchgear generally, which was looked upon as the weak point in electrification.

Domestic Electricity.—Mr. R. B. Mitchell, engineer and manager of the Glasgow Electricity Department, delivered a short address on "Domestic Electricity" to the members of the City Business Club on May 7th. Dealing with the present position in Glasgow, he stated that out of a total of 200,000 residences in the city only some 18,000, or 9 per cent., had electricity installed. This did not compare at all favourably with American cities, and he instanced Chicago, where 80 per cent. of the residences were connected to the electricity supply; in American cities generally from 600 to 700 kWh was used per head of the population, against 150 kWh per head in Glasgow. This development had been brought about by making things easy for the consumer, and something of this kind would be required before electricity would be within the reach of all. Mr. Mitchell then made reference to the hiring and hire-purchase schemes established recently in Glasgow. The value of the electric service for lighting, heating, cooking, and other domestic uses was dealt with in some detail, and the advantages of the various appliances on the market were fully set forth. Mr. Mitchell mentioned some of the more recent applications of electricity, and instanced (1) heat storage in water, the water being heated by electricity during the night (when most of the plant in the power station was idle) for use next day, and (2) the ultra-violet ray from electric arc or mercury-vapour lamps for curative and tonic treatment. These uses would be considerably extended in the near future. Details were then given of the low rates available in Glasgow for electricity, which placed the supply within the reach of the smallest householder, and Mr. Mitchell concluded by stating that in the old days the cry was that people could not afford electricity, but all that had been changed, and now people could not afford to do without it.

Correspondence.

***Correspondents should forward their communications* at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Aeroplane Crashes and Ignition Circuits.

No one will be more satisfied than myself if it can be proved that the firing equipment of our aeroplane engines is above suspicion; but there seems to be ample evidence that magnetos fail far too frequently. I quite agree that if my opinion, that there is a weakness in regard to the method of the connections as shown in figs. 2 and 3, is wrong, it should be controverted as widely as possible, as it would be most undesirable and possibly harmful to create in the minds of pilots any false impressions respecting the reliability of the equipment supplied to them.

Mr. Clark's further contribution on this subject is most interesting, particularly in regard to the actual experiments made, resulting in a p.d. of a few hundreds of volts at the condenser terminal in both cases of figs. 1 and 2. Additional details of the tests and actual results would be welcome.

Information has reached me recently that the Rolls-Royce Co. use mica condensers, which gives the impression that they must have experienced trouble with paper condensers. If so, what was the trouble?

It is not a difficult matter to strengthen the insulation of condensers and of primary windings to withstand any voltage that may occur with any average ignition coil or magneto; but I think there is no doubt that the majority of coils and magnetos have not exceptional insulation on the primary windings and are not fitted with mica condensers. It would be a surprise to me if any of the primary windings or condensers that I have used would stand up to a test of 600 volts, and the usual test for well-made condensers is 400 volts d.c.

Possibly the condensers for magnetos are made of smaller values than that of the old-type condensers for ignition coils, having a value of about one-third of a microfarad. With smaller values the voltage of the charge in the condenser would, of course, be higher.

Has Mr. Clark any explanation to advance for the many failures of magnetos, which, from the general construction point of view, are well made?

If the induced current in the primary coil, acting as part of the secondary circuit, is worth having, it is surely of some intensity. On the other hand, if it is of small account (Mr. Hunt says 1 or 2 per cent.), is it worth the departure from fig. 1, against which there is up to the present no adverse comment?

My 27 years' experience with fig. 1, with no failure, may be due to some special favour of motoring deities, but it does seem to confirm the fact that there is nothing wrong with fig. 1, when the values used are equivalent to those used some ten or twenty years ago. If other experiences of fig. 1 connections are similar to mine, while failures of fig. 3 connections are fairly extensive, even though mica condensers are sometimes used, then it points to some weakness somewhere, perhaps arising only when a minor defect develops in some other part of the firing system.

I have now altered my connections from fig. 2 to that shown in fig. 5 by crossing the two external wires concerned, with quite satisfactory running up to the present. It is the nearest approach that I can obtain to fig. 1 with the present coil.

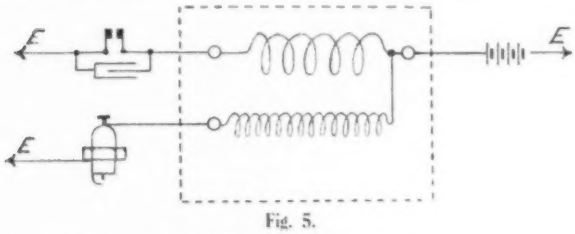

Fig. 5.

Its only drawback to my mind is that the high-voltage secondary current has to wander in and out of the switch, then through the battery to complete its circuit. On some cars the battery is placed at the rear of the vehicle, and although there may be no theoretical disadvantage is compelling the secondary curent to take this round-about route when a much more direct one can so easily be obtained, it certainly seems to be an unnecessary and unreasonable thing to do.

With regard to the letter from "Vammos," the corrosion of the copper wire is quite apart from the use of any soldering fluid. No reliable maker of coils would use anything else but resin for making a soldered connection in a coil, and yet there are quite a number of cases where corrosion inside the coil has taken place. I knew of a case where a disconnection took place in the centre of a secondary winding, where the copper wire had corroded next to a piece of waxed paper which had been placed around a twisted joint. The joint showed no signs of corrosion whatever, whereas the adjacent wire had been eaten through. Was this due to something in the wax, or was it "sweat" from the fingers that had put the paper on? I think the latter may have been the real cause.

The N.U.4 type of magneto is new to me, and the advantage of such an arrangement is not apparent when it involves almost twice the voltage in the secondary coil, and consequently greatly increased insulation.

I, too, should like to know how often the primary windings break down. I have seen one which appeared to have shorted and to have burnt out in consequence.

It is agreed that mica condensers should not fail, and it would be interesting if the B.T.-H. Co. would give some information as to the location of any failures that may have occurred in any of their magnetos. No doubt they have some records which might throw some useful light on this important subject.

The coils I measured gave 2,000 ohms or thereabouts for the secondary winding, not 200,000. In regard to Mr. Hunt's letter in your last issue, my opinion seemed to be supported by the fact that I obtained a spark of about ten mils at an additional spark-gap across the condenser in one case and not in the other.

H. C. Booth.

London *May 5th*, 1925.

Installation Accessories.

When one has taken some part for a generation in extending the use of electricity, the time comes when one has to look at the matter mainly as a mere consumer. In this guise I wish to call the attention of manufacturers to the unsatisfactory position with regard to some of the accessories on which the comfort of the householder depends.

With the full intention of giving credit where credit is due, I may say that I have an "Archer" kettle (G.E.C., No. 47,543) which must be about 25 years old; a Thomson-Houston flat-iron of about the same age; and a vacuum cleaner two years old. All have been in regular use, without repairs, and have given every satisfaction. But . . .

There is generally a "but." These things are all in ordinary domestic use, and the two first-named have never given trouble of any sort, except for the renewal, at long intervals, of the flexible. The third, of course, is more liable to mishandling; the makers know that. In these two years I have had to attend to no fewer than 35 burns-out of the cord. There are eight yards of workshop flex, ending in a lamp adaptor; to this I had added a long extension piece of "cab-tire" with a lamp-holder at one end and a power plug at the other. The power plug, being designed on proper lines, so that no direct pull can come on the flex, has never been touched. Nor has the end attached to the machine itself. Both adaptor and lampholder burn out with annoying frequency, simply because, though sent out for the work, they are totally unsuitable. There is nothing to take the inevitable strain when the cord reaches its limit; the adaptor has not even a cord-grip. Surely it would not be difficult to design a suitable arrangement for the extension cord? Then, again, the cord itself, as it must obviously be exposed to strain, could not it have a core wire to take that strain? Mine burns out regularly; even the "tough rubber compound" has gone once, though that is some support.

I am able to do these tiresome and unnecessary repairs, but I *ought not* to have to. Most householders would have to pay for every one of them. Having written to the manufacturers and to their local agents, and having spoken to two travelling representatives without the smallest result, I am compelled to appeal to the profession through your columns. The gas people do not ignore complaints in this way.

J. W. Meares.

Guildford, *May 6th*, 1925.

A City Guilds Examination Question.

At the recent examinations in "Electrical Installation Work," held by the City and Guilds of London Institute, the following question was set in the final grade written paper:—

"You are sent to an installation to make insulation tests and report as to the insulation of each individual circuit. You turn off the main switch and then connect up your instrument at the distribution fuseboard, which you find to be ten-way. You leave the lamps in their holders, turn off the circuit switches, withdraw all fuse-bridges, and test the insulation to earth of each circuit individually by connecting the line wire of your instrument to each circuit terminal in turn, and you find that on the positive pole each of the ten circuits has an insulation resistance to earth of 0.4 megohm; and on the negative pole each has an insulation resistance to earth of 0.3 megohm.

(*a*) What would be the calculated insulation resistance of the ten circuits taken together with both poles connected to the line wire simultaneously?

(*b*) You now replace all fuses, turn on the local switches, but not the main switch, take a reading with your line wire connected to both busbars simultaneously, and find it to be 0.2 megohm. Explain the probable cause of the difference between the calculated resistance (*a*) and the measured resistance (*b*).

(*c*) State what steps you would take to ensure correct results appearing in your report."

It will be seen at a glance that the insulation resistance of the negative side of the installation alone is .03 megohm, yet the examiner gives .2 megohm as the insulation resistance of the whole installation, including mains and part of the main switch.

In test (*b*) the testing instrument might have been affected by leakage current from the supply across the main switch, but if that is the essence of the question, it appears to me hardly fair to the majority of candidates, who have yet to gain their experience in this direction.

If you or some of your readers care to suggest a more practical solution to the question, no doubt many candidates from this examination will thank you.

J. A. Moore.

London, *May 4th*, 1925.

Clerical Appointments.

I would esteem it a favour if any of your readers could inform me what salaries are usually afforded to oncost accountants or oncost clerks in electrical or mechanical engineering businesses and any other useful particulars regarding these posts.

O. A.

Cage Aerials.

I have been interested in reading the letters of your correspondents as to their experiences of cage aerials. From their remarks this type of antenna does not appear to have received their blessing. On the other hand, they may be interested to hear that, having erected three aerials of the cage pattern, I have had considerable success with various types of radio sets, in conjunction with them.

The nearest stations to this city are Cardiff and Birmingham, each about 54 miles distant, reception being tested mainly with those transmissions.

In case A, this set (two-valve, 1 H.F., 1 D) has, among other satisfactory results, received U.S.A. direct, the owner enjoying a concert from America up to 5.0 a.m.

Case B (similar set) receives 2 LO, Spain, Cardiff, Bournemouth, Birmingham, and Chelmsford, to mention a few results; the cage in this instance is erected upon the top of a building, the position, in my opinion, not being of the best.

Case C (four-valve, loud speaker): results are heard in every part of the house.

To prove the receiving efficiency of the cage, a special test was carried out, using a crystal set 4½ in. square, upon a very wet evening, when the insulation of the aerial in question could be expected to be at its worst. Even under those conditions Birmingham was quite audible.

This test proved to be the culminating point in silencing local criticism as to the cage aerial. The adverse conditions met with are: (*a*) A tremendous wind pressure, necessitating special staying, and (*b*) probabilities of low insulation in wet weather. Nevertheless, with the results mentioned, and one-pole fixing, in limited areas and where there is a lack of facilities, the cage has many advantages.

H. W. Haydon.

Gloucester, *May 6th*, 1925.

Maxtorq Motors.

In reply to the Lancashire Dynamo & Motor Co.'s letter of the 20th ultimo, I must say that had Mr. Wood informed us in the first instance that he had no intention of giving the information requested, this correspondence would not have dragged on to the extent it has. The claims, as I understand them, made by the L.D. & M. Co., for their "Maxtorq" motors are:—

(1) That the Maxtorq crane motor is something better than a high-resistance-rotor squirrel-cage motor as regards inching and acceleration. (See ELECTRICAL REVIEW, April 10th, page 573.)

This point depends on the shape of the "speed-torque" curve.

(2) That the starting current of continuously rated Maxtorq motors is so far reduced by certain design characteristics that supply companies will permit these motors to be thrown direct on the line at starting in those cases where ordinary motors would not be allowed. (See ELECTRICAL REVIEW, March 20th, pages 460 and 461.)

If the motors have these characteristics, this development certainly marks an epoch in the history of induction motors. Under these circumstances I did think and evidently you, as Editors of one of the leading electrical journals, agreed with me, that there was some justification for a request for more details.

I have examined the L.D. & M. Co.'s patents, Nos. 13,504/08, 175,355, 180,064, 196,726, and 212,664, and cannot find anything relating to the two claims mentioned. I have also inspected several Maxtorq rotors and have been unable to find anything which might result in the performances claimed.

I have not in this correspondence decried the progress and development of the squirrel-cage induction motor, and it is undoubtedly a better machine to-day than it was 20 years ago. My remarks, of course, applied to the particular characteristics claimed and to these only.

Mr. Wood has kindly invited me to see a demonstration of what L.D. & M. squirrel-cage motors will do. The proper channel to substantiate the claims, however, is through the medium in which they were first made; but if Mr. Wood is still certain that he can convince me on the two claims in question by a demonstration, then I shall be pleased to give him the opportunity he desires. The points which I have raised could easily have been replied to on paper and, in fact, to a large extent without giving private information away. I regret that the L.D. & M. Co. cannot see their way to explain the points, but since they have so decided there is nothing further to be said.

D. B. Hoseason, A.M.I.E.E.

Bowden, Cheshire, *May 7th*, 1925.

Mr. Baldwin's Telephone History.

I should be glad of permission to point out a serious inaccuracy in respect to the Guernsey States' telephone system which appears in this book.

In response to Mr. Baldwin's application I supplied him with correct statistics. He has nevertheless altered my figures and presented his readers with erroneous information.

He states in his Table 12 that on December 31st, 1923, there were only 2,717 subscribers' and 62 public telephones in the Island, making a total of 2,779, equal to one telephone in 14 of the population, whereas I had informed him that there were 3,215 telephones, equal to one telephone in 12 of the population. He is consequently 436 telephones short.

Not only has he altered my 1923 figures, but he has made similar and unjustifiable deductions for the past 25 years of the Telephone Department's existence, right away back to 1898.

I should like to know why. Surely the essentials of history are accuracy and impartiality.

E. H. Bennett,

Manager, States' Telephone Department.

Guernsey, *May 6th*, 1925.

The Position of Non-Statutory Suppliers.

I should like to know how the last Electricity Act bears upon the following conditions.

A small unauthorised company has been supplying a village for many years. The local authority has obtained a Special Order for the district, and this Order contains powers to run along certain roads along which the company's overhead lines run at present. These roads are not otherwise under the control of the local authority—another authority maintains them.

It is known that the new suppliers cannot directly compel the company to stop. But this is the question: Can they, under the Act, compel it to remove the mains?

X. Y. Z.

May 7th, 1925.

National Electric Power.

With regard to the articles on "National Electric Power" which have been appearing in your journal, if I understand your contributor aright, he criticises my proposals on the assumption that the creation of a National Electricity Board would result in all generating authorities having but a single market (the Board) for their outputs.

He has misread my proposal. All efficient authorities would continue indefinitely to generate and supply their respective areas. The Board would, however, provide inter-connecting facilities between them, take supplies from them, and provide the means whereby inefficient stations could be given economic bulk supplies, whereby in consequence they could be shut down. The Board's activities in the matter of buying and selling would be governed entirely by price relationship.

In view, Sirs, of your editorial of April 24th, I would like to make it clear that my proposals do not involve nationalisation, and the fact that the Government may guarantee initial capital is no more nationalisation than is the present operation of the Trade Facilities Act.

Geo. V. Twiss.

Westminster, *May 11th*, 1925.

Lead-covered Wiring and Visible Bonding.

I agree with "A.M.I.E.E." to leave alone the so-called lead-covered wiring, as the only solution to the bonding trouble. During the past five year I have installed over 30,000 yd. of tough rubber-sheathed cables, both for surface and concealed work, indoor and outdoor, with most satisfactory results, and apparently immune from breakdowns.

J. Dean.

Aberystwyth, *May 4th*, 1925.

I have noticed lately several communications on the subject of visible bonding on metal-sheathed systems, and my experience, extending over some eight years on these installations in the tropics and with some three hundred buildings to look after (not simply install), may be of interest to some of your readers.

My largest building is designed for 400 amperes per side on a three-wire, 225/450 V, d.c. supply. Out here surface wiring is a necessity, since the saltpetre and other salts rapidly eat away the metal sheathing if it is buried; this particularly happens during the rains.

I have found that except in extremely dry buildings, which are conspicuous by their absence, during the rains metal bonding boxes have given a lot of trouble; in fact, I never use them now, all bonding being done in a teakwood box impregnated with shellac dissolved in spirits, and painted to suit the room. The actual bonding is done on a continuous strip of tinned copper or soft brass, the junctions being made in the usual insulator junction pieces.

In certain cases it has been necessary to fill the boxes with bitumen; ample space is given for teeing out.

It has been found that the most important thing in metal-sheathed wiring in this country is proper earthing, and not only are thoroughly good earth plates necessary, but the maximum resistance to earth must be kept within a very small limit. All tests have to be made from the farthest point of the installation from the earth plate, and thus include any bonds in between; this test for all Government work must pass ½ amp. at a pressure of 4 volts.

I enclose for your information a specification to which all contractors have to work, if doing work for any of the Government authorities, and I think you will agree that if it is strictly adhered to a good job will be done.

Battiwallah.

Calcutta, *April 23rd*, 1925.

[Our correspondent is to be thanked for the very valuable and practical information that he has furnished, which should be of great assistance to many engineers who are called upon to install wiring in hot and humid climates, of which they had no previous experience. The specification is generally based upon the I.E.E. Wiring Rules, with modifications to suit local conditions.—EDS. ELEC. REV.]

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

24,943. "Railway, tramway, and road vehicles." C. E. Holden. October 8th, 1923. (Cognate application 26,515 23.) (Patent of addition not granted.) (231,927.)

25,699. "Wireless receiving apparatus." J. Scott-Taggart and Radio Communication Co., Ltd. October 15th, 1923. (232,182.)

25,852. "Thermionic or like high-frequency generators." W. Dubilier. October 16th, 1923. (232,272.)

25,899. "Means for and method of supplying charging currents for electric cables." A. M. Taylor. October 17th, 1923. (Cognate applications 17,003/24 and 18,494/24.) (232,275.)

32,102. "Means of and apparatus for generating and controlling positive ion currents." British Thomson-Houston Co., Ltd. December 21st, 1922. (208,728.)

1924.

364. "Electric switches." A. D. Elliott. January 5th, 1924. (232,294.)

1,003. "Wireless sets of the unit type." W. Fennell and C. R. Fennell. January 14th, 1924. (232,314.)

1,007. "Telephone receiver units." Morrison Laboratories Inc. and V. E. Morrison. January 14th, 1924. (232,317.)

1,149. "Thermionic valves or electron discharge tubes." Mullard Radio Valve Co., Ltd., S. R. Mullard and B. Hodgson. January 15th, 1924. (232,318.)

1,155. "Means for supporting filaments in thermionic vacuum tubes or valves." C. Seymour and H. R. Cantelo. January 15th, 1924. (232,319.)

1,156. "Filaments for thermionic vacuum tubes or valves." C. Seymour and H. R. Cantelo. January 15th, 1924. (232,320.)

1,192. "Telephone systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. January 15th, 1924. (232,321.)

1,204. "Protective arrangements for alternating-current systems." British Thomson-Houston Co., Ltd., and A. S. Fitzgerald. January 15th, 1924. (Addition to 193,434.) (232,324.)

1,355. "Construction of railway conduits for gas mains, electric conductors, and the like." G. H. Swanton and A. Echberg. January 17th, 1924. (232,332.)

1,408. "Electric cable connecting boxes or couplings." C. D. Gullick and W. J. Leonard. January 17th, 1924. (232,334.)

2,078. "Electric interrupters or automatic switches." W. Hancock and F. F. Middleton. January 25th, 1924. (232,353.)

3,629. "Wireless receiving circuits." H. J. Warner and H. Tyler. February 12th, 1924. (232,363.)

3,669. "Electric power generating stations." C. W. E. Clarke. February 12th, 1924. (232,364.)

3,940. "Adaptors, terminals, or connectors for making electrical connections." C. J. Sutton. February 15th, 1924. (232,366.)

4,031. "Illuminated advertising and display devices." T. Mathews & Co., Ltd., and T. Jarvis. February 16th, 1924. (232,368.)

4,781. "Spot lamps for automobiles." T. M. Bragg. February 25th, 1924. (232,374.)

4,782. "Automobile headlamps." T. M. Bragg and J. F. Howarth. February 25th, 1924. (232,375.)

4,829. "Control of apparatus at an electric power sub-station from a central control office." Automatic Telephone Manufacturing Co., Ltd. April 30th, 1923. (215,321.)

5,031. "Wireless receivers." S. J. Eintracht. February 27th, 1924. (232,378.)

5,057. "Electric control apparatus." A. E. White (Socony Burner Corporation). February 27th, 1924. (232,380.)

5,807. "Electric terminals." C. R. Belling, E. M. Lee, H. O'Connell, and C. L. Arnold. March 6th, 1924. (232,384.)

6,615. "Method and means of rectifying electric oscillations applicable to radio-telegraphy, radio-telephony, and the like." A. W. Sharman. March 14th, 1924. (232,390.)

7,308. "Variometers." G. Pelletier. March 22nd, 1923. (Addition to 207,825.) (213,281.)

7,477. "Resilient composition for mounting tympans or diaphragms for sound reproduction." F. A. E. Jenkins. March 24th, 1924. (232,394.)

9,053. "Rheostats for wireless receiving sets and the like." W. J. Davis and Edison Swan Electric Co., Ltd. April 9th, 1924. (232,405.)

9,144. "Electrical fuses." D. G. Robinson. April 10th, 1924. (232,407.)

10,769. "Trip or release mechanisms for electric circuit-breakers and like apparatus." G. Ellison and T. Brown. May 1st, 1924. (232,418.)

11,598. "Operative system for alternating current supply meters having a counter pole for magnetic and mechanical connection of the current iron and voltage iron." W. Strelow. May 17th, 1923. (216,122.)

11,685. "Plug-and-socket connectors and adapters used in or with electrical circuits and apparatus." A. P. Lundberg, G. C. Lundberg, P. A. Lundberg, and G. Pegg. May 12th, 1924. (232,422.)

12,184. "Electrically-driven invalid chairs and like vehicles." L. Murphy and J. & A. Carters, Ltd. May 17th, 1924. (232,425.)

12,280. "Locks for incandescent electric lamps and the like." W. W. Warrington. May 19th, 1924. (232,426.)

12,752. "Electrically-driven clockwork." T. Rushton. May 24th, 1924. (232,428.)

13,683. "Electromagnetically operated switchgear." E. Volkers. June 4th, 1924. (232,433.)

14,310. "Detectors for wireless telephony and like purposes." A. Williams. June 13th, 1924. (232,444.)

14,335. "Apparatus for obtaining intermittent unidirectional currents of electricity from alternating currents." A. Barnett. June 13th, 1924. (232,445.)

15,046. "Removable wiring system for interchanging circuit arrangements in wireless telephony receiving apparatus and the like." A. G. Hay. June 23rd, 1924. (232,450.)

15,440. "Regulating system for dynamo-electric machines." British Thomson-Houston Co., Ltd. (General Electric Co.). June 26th, 1924. (232,452.)

15,684. "Alternating-current electromagnets." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.) June 30th, 1924. (232,455.)

16,143. "Electric arc welding apparatus." Harms & Co. February 14th, 1924. (229,246.)

16,524. "Electrolytic decomposition apparatus." Nordiske Fabriker De-No-Fa Aktieselskap. August 29th, 1923. (221,189.)

18,935. "Device for audibly indicating whether an electric light is in or out." A. Shaw and F. Fairer. August 9th, 1924. (232,473.)

18,957. "Stepping switches." Siemens & Halske Akt. Ges. and F. Döring. August 9th, 1924. (232,474.)

19,073. "Rheostats or electric resistances." F. S. Stuckey and Falk, Stadelmann & Co., Ltd. August 11th, 1924. (232,476.)

19,399. "Multi-polar oil-break switches." Sachsenwerk Licht-Und Kraft Akt. Ges. March 3rd, 1924. (Addition to 223,196.) (230,003.)

19,503. "Variable electric plate condensers." Dr. E. Brauer. August 24th, 1923. (220,943.)

20,205. "Electrolytic apparatus." Nordiske Fabriker De-No-Fa Aktieselskap and Dr. C. F. Holmboe. February 19th, 1924. (229,624.)

20,621. "Mounting of electric motors for hand vacuum cleaners and the like." G. O. Lehmann. October 18th, 1923. (223,541.)

20,771. "Loading apparatus for transmission circuits, such as telephone circuits." Western Electric Co., Ltd. September 18th, 1923. (226,491.)

21,287. "Means for automatically regulating the current generated by a variable-speed dynamo." Ateliers de Constructions Electriques de Charleroi Soc. Anon. October 27th, 1923. (223,880.)

24,141. "Regulating mechanism for electrical apparatus." British Thomson-Houston Co., Ltd. October 11th, 1923. (223,246.)

25,279. "Crystal detectors, more particularly for wireless reception." N. B. Davis. October 23rd, 1924. (232,506.)

26,291. "Electrical relays." Westinghouse Brake & Saxby Signal Co., Ltd. February 11th, 1924. (229,259.)

1925.

802. "Electric power supply. J. F. Smith. November 8th, 1923. (Divided application on 228,631.) (232,529.)

3,287. "Electric driving of ring spinning and twisting frames and the like." Naamlooze Vennootschap Fabriek van Electrische Apparaten Voorheen F. Hazemeyer & Co. February 5th, 1924. (228,916.)

3,980. "Electrical valve amplifiers." W. H. Priess. November 14th, 1923. (Divided application on 28,762/23.) (232,534.)

4,399. "Method of reducing cross-talking in telephone cables." Felten and Guilleaume Carlswerk Akt. Ges. March 17th, 1924. (Addition to 222,436.) (230,807.)

5,935. "Electric junction boxes and means for bonding metal-covered cables thereto." F. C. Raphael and W. T. Glover & Co., Ltd. December 12th, 1923. (Divided application on 230,544.) (232,539.)

The International Conference on Large High-pressure Networks.—As previously announced, the third International Conference will be opened at Paris on June 16th, and will last until June 25th. We are informed by the general secretary, M. J. Tribot Laspière, that a very large number of enrolments has been made already, and that 23 nations will take part in the conference, as compared with 20 in 1923 and only 12 in 1921. Italy is sending no fewer than 27 delegates, Russia 18, Great Britain 14, Spain 12, and Holland 8, the total number of delegates registered at present exceeding 100. More than 100 French engineers will be present.

Forty reports have been received, and many others are being forwarded. Amongst the most important of these are the following: Communication by wireless telegraphy between power stations; disturbances on telephone lines due to high-pressure mains; the regulation and distribution of power in coupled networks; experimental study of surges; characteristics of turbo-alternators feeding lines of large capacity; regulation of phase and pressure; tests for high-pressure insulators; the economic limits of outdoor sub-stations; the specification of oil for transformers.

The value of the Conference is not confined to the papers submitted; even more fruitful are the discussions and the exchange of ideas based on actual experience. The address of the secretary is: Boulevard Malesherbes, 25, Paris, where full information can be obtained regarding the conference.